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ABSTRACT

Prepared in response to the 1984 General Appropriations Act (Chapter 84-220, Laws of Florida), this report examines the feasibility of establishing a community college satellite telecommunications network within Florida to allow for the reception of programming transmitted by satellite and for teleconferencing. Following an executive summary, section I offers introductory material on a proposal submitted by Associated Industries of Florida (AIF) to develop a system of satellite receiving stations to be located at the state's 28 community colleges; and the responsibilities, approach, philosophy, and activities of the Postsecondary Education Planning Commission (PEPC) with respect to its study of the feasibility of the AIF proposal are also described. Section II reviews the 1982 PEPC report on educational technology in Florida, covering such topics as the types and increased use of educational technology, and state-level policy issues. Section III provides an overview of telecommunications technologies currently in use in Florida, including live video transmissions, live audio transmissions, and telecourses. Section IV presents a brief description of audio and video teleconferencing technology and applications and includes tables detailing ways in which specific organizations are using the technology. Section V offers an analysis of the proposed community college satellite network and presents the results of a needs assessment survey of postsecondary educational institutions in the state. Finally, in section VI, conclusions and recommendations are provided including that: (1) a satellite network system should be developed; (2) a state-level office within the Department of Education should develop the system and coordinate its usage; (3) a technical analysis of existing satellite receiving equipment should be undertaken; and (4) funds to purchase the equipment and cover operating and maintenance expenses should be appropriated specifically for that purpose, with the expectation that, in time, operating and maintenance expenditures would be supported through user fees, funds generated by credit instruction, and other non-state sources. (RC)

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FLORIDA SATELLITE NETWORK STUDY

Report and Recommendations of the

FLORIDA POSTSECONDARY EDUCATION PLANNING COMMISSION

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1985-REPORT 2

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The Postsecondary Education Planning Commission initially created by executive order in 1980 and subsequently given statutory authority, serves as an advisory body to the State Board of Education on all postsecondary education matters. The Commission is composed of 11 members of the general public and one full-time student registered at a postsecondary education institution in Florida. Members are appointed by the Governor with the approval of three members of the State Board of Education and subject to confirmation by the Senate.

The major responsibility of the Commission is preparing and updating every five years a master plan for postsecondary education. The enabling legislation directed that the Plan "shall include consideration of the promotion of quality, fundamental educational goals, programmatic access, needs for remedial education, regional and state economic development, demographic patterns, student demand for programs, needs of particular subgroups of the population, implementation of innovative educational techniques and technology, and the requirements of the labor market. The capacity of existing programs, in both public and independent institutions, to respond to identified needs shall be evaluated and a plan shall be developed to respond efficiently to unmet needs."

Other responsibilities include recommending to the State Board of Education program contracts with independent institutions; advising the State Board regarding the need for and location of new programs and branch campuses of public postsecondary education institutions; reviewing public postsecondary education budget requests for compliance with the State Master Plan; recommending to the Commissioner of Education proposals for support through the Postsecondary Cooperation Trust Fund; and periodically evaluating the State's 28 regional coordinating councils for vocational education, adult general education and community instructional services.

Further information about the Commission, its publications, meetings and other activities may be obtained from the Commission office, 304 Knott Building, Department of Education, Tallahassee, Florida, 32301; telephone (904) 488-7894.

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POSTSECONDARY EDUCATION PLANNING COMMISSION

Florida Satellite Network
A Feasibility Study

A Study Pursuant to the

1984 General Appropriations Act

(Chapter 84-220, Laws of Florida)

1985 - Report 2

February 21, 1985

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EXECUTIVE SUMMARY

The 1984 Legislature directed the Postsecondary Education Planning Commission "to study the feasibility of the Florida Community College Satellite Network" and "to submit a report by March 1, 1985."

In 1982, Associated Industries of Florida proposed to the Florida Legislature the development of a satellite telecommunications network within Florida. The proposed network was to be located at the twenty-eight community colleges and allow for the reception of programming transmitted by satellite and for teleconferencing within the State.

Issues Concerning Satellite Telecommunications in Florida

The Commission included the following issues in its considerations:

(a) an assessment of the current and future use of and need for educational technology in the postsecondary educational institutions in Florida;
(b) the ability, cost-effectiveness, and appropriateness of telecommunications to address the current and future educational and societal needs in Florida;
(c) the impact of increased telecommunications on the quality and quantity of services available to the citizenry of Florida; and
(d) a determination of the most effective organizational structure for the implementation, operation, and scheduling of a statewide telecommunications network.

Commission Activities and Procedures

The Chairman of the Postsecondary Education Planning Commission appointed a committee of four Commission members to receive testimony and submit a report to the full Commission.

The Commission reviewed the 1982 Commission Report on Educational Technology in Florida which emphasized the use of educational technology for instructional purposes and its potential for use in academic and career counseling, data processing, faculty and administrative professional development, and noncredit and community instruction.

The Division of Communications of the Department of General Services provided the Commission with a cost analysis of the proposed satellite network and an estimate of the costs of a state-level office charged with coordination and implementation.

Commission staff conducted a review of educational programs that are being provided around the nation through telecommunications, and provided an analysis of current technologies and their applications for teleconferencing and other systems of telecommunications.

In addition, the Commission surveyed all Florida public postsecondary educational institutions to determine which institutions presently own satellite receiving dishes, to assess institutional interest in the proposed network and

the willingness to commit institutional resources, and to identify the type of students or community groups that might utilize such a system.

Analysis of the Proposed Satellite Network

Associated Industries of Florida has proposed that the State of Florida establish a community college satellite network consisting of a satellite receiving dish, or downlink, at each of the 28 colleges around the State. The system would only provide receiving capability. Transmission of programming would be possible at sites which already have uplinks. The one-way video and two-way audio format would be suitable for classroom instruction, continuing education, and special events programming at the institutions. Also, the system could be used by area community organizations, businesses, and industries for educational programs or statewide meetings. Judging from the experiences of existing systems in other states, the network would probably most often be used for continuing professional education programming. General course instruction by satellite would probably not be cost-effective. The capabilities of the system would also be suitable for state agency heads to hold meetings with personnel in regional offices or for legislators or Cabinet members to address constituent groups.

Associated Industries has estimated that to equip 28 sites with the necessary equipment would cost $651,797. At the request of the Commission, the Department of General Services (D.G.S.) conducted a cost analysis and produced a similar estimate of $673,298. D.G.S. also provided an estimate of $56,000 for the cost of maintaining a state-level office for the implementation and coordination of a statewide system.

The implementation of a statewide telecommunications system may result in decreased travel costs for state agencies but the more likely effect is to improve the quality of communications and information flow. Teleconferencing should facilitate meetings both in terms of increased participants and additional access points connected to the meeting site.

Needs Survey of Postsecondary Education Institutions

The state community colleges, area vocational education centers, and universities were surveyed by the Commission to determine what equipment was already in place on the campuses and to assess actual or estimated need for teleconferencing services. A significant majority of the institutions responding indicated that the proposal was both feasible (64%) and needed (59%). Of the twenty-five community colleges that responded, seven are already equipped with satellite dishes. None of the area vocational centers has a satellite dish, but the survey revealed that there are four satellite dishes in the state university system. The survey also revealed that the two-way audio portion of the system is already in place and, therefore, would require no additional capital expenditures. Through the survey, a number of concerns were expressed by campus administrators in regard to the financing of the daily operation, maintenance, and promotion of the system, and the need for personnel training.

Conclusions

The proposed satellite network offers a number of educational and service opportunities for the State of Florida. Considering the size of Florida and the

location of the state capital and several state universities in the less populated areas of the State, the system would provide an excellent means to improve the quality of communications within the State, provide access to national program material and help avoid some state travel.

While it is difficult to estimate the exact volume of use of the system the design is flexible enough to encourage use by the public and private sectors at the local and state level. A survey revealed that a considerable amount of equipment needed for the system is already owned by postsecondary educational institutions. The Commission reviewed other technologies that might be suitable for such a system and noted that the telecommunications field is in a dynamic phase and that the State should not overly commit to one single technology. The proposed system does not call for a large capital investment, given the number of sites and the area it will cover.

The Commission also identified the need for a centralized, state level office to coordinate the operational functions such as scheduling and programming, providing technical assistance to the campuses, promoting use of the system, and establishing fee schedules.

RECOMMENDATIONS

Feasibility

The Commission finds that the establishment of a statewide network using satellite technology is feasible and that the system should be set up on a regional basis. The initial plan should call for implementation of 28 sites. Although the community college regions provide a framework for access, any public postsecondary institution within each region would be a potential host for the system.

1. A satellite network system should be developed to provide regional access for all of Florida's citizens. A fully implemented system should provide access in each of the 28 community college service regions. The statewide network should not be limited to community colleges. All public postsecondary institutions should be considered as potential sites for placement of dishes.

Statewide Management

A state-level office should be responsible for developing policies and procedures for a statewide network including assessing need for additional equipment, distributing funds for the purchase of equipment or for maintenance, publicity and other expenditures; working with the institutions to coordinate and schedule statewide teleconferencing events, and providing technical assistance to the institutions.

2. An office at the state level should be assigned responsibility for the development of the system and for coordinating its usage.

Location of Office

The Department of Education has considerable expertise as represented by the Office of Education Technology and Communication, the Office of Instructional

Television and Radio and Educational Products Distribution, and the Office of Florida Public Broadcasting.

3. The state level office should be located in the Department of Education.

Use of Existing Equipment

A considerable amount of equipment is already owned by postsecondary educational institutions in Florida. There are eleven institutions that already own a total of twelve satellite receiving dishes, ten of which appear suitable for this system. The audio portion of the system is already available.

4. The State should undertake a technical analysis of the existing satellite receiving equipment in Florida's postsecondary institutions to ascertain compatibility with the statewide satellite network.

Expansion of the System

The designated office would be responsible for the expansion of the system to meet the goals of statewide coverage. After assessing the compatibility of the existing equipment to be part of a statewide system, the office would be responsible for determining the need for any additional sites beyond the original 28 and for developing an implementation plan. The plan should address the specific site selection within each community college region. Site selection must be made both in terms of which postsecondary education institution in a region and which campus of the selected institution would be the most effective location.

5. An implementation plan should be developed for determining the number of new sites needed, their location and the timetable for installation.

Appropriations for the System

To implement a statewide network, monies would be needed for support of the statewide management office, technical analysis of existing resources, additional receiving sites and the support for initial maintenance, publicity and other expenses at the sites.

6. The funds to purchase the equipment and to cover operating and maintenance expenses should be appropriated specifically for that purpose. In time, operating and maintenance expenditures should be supported through user fees, funds generated by credit instruction and other non-state sources.

I. INTRODUCTION

The 1984 Legislature directed the Postsecondary Education Planning Commission "to study the feasibility of the Florida Community College Satellite Network" and "to submit a report by March 1, 1985."

Proposal of Associated Industries

In 1982, Associated Industries of Florida, a business service company, proposed to the Florida Legislature the development within Florida of a system of satellite receiving stations to be located at the twenty-eight community colleges. The community colleges were chosen as sites because they are located within commuting radius of most of the Florida population. The satellite network would allow for the reception of programming transmitted by satellites and would allow teleconferencing within the State. The proposed system would have an interactive audio component which would allow participants at the receiving sites to communicate directly with the transmitting site. Associated Industries argued that such a system would improve the flow of information and reduce state travel costs dramatically. The complete text of the Associated Industries proposal forms Appendix A.

Commission's Responsibilities in the Area of Educational Technology

In Chapter 240.145, Florida Statutes, the Postsecondary Education Planning Commission is charged with preparing and submitting to the State Board of Education a master plan for postsecondary education. One of the specific items to be addressed in the plan is the "implementation of innovative educational techniques and technology."

In 1982, in preparation for the writing of the Master Plan for Florida Postsecondary Education, the Commission staff surveyed the postsecondary educational institutions on their use of and need for educational technology and proposed a number of state-level policies to improve the use and coordination of educational technology in Florida postsecondary education. This document has served the Commission as a source of information about present usage of educational technology in Florida, about the promises and pitfalls of different types of technology, and about the type and level of coordination needed to ensure their most cost-effective use.

Commission Approach and Philosophy

The Chairman of the Postsecondary Education Planning Commission appointed a committee of four Commission members to study the proposal and submit a report to the full Commission. The Commission approached the study with one important assumption, to not limit itself to an analysis of the system as proposed by Associated Industries. While that proposed system would be thoroughly considered, the Commission retained the right to make recommendations that might expand upon, modify, or differ substantively from the Associated Industries proposal.

The Commission considered a range of issues including unmet educational and societal needs in Florida and the ability, cost-effectiveness and appropriateness of telecommunications to address them. The Committee sought to know whether an increased telecommunications capacity would allow for an

expansion in the number of people served, and the nature of services offered or an improvement in the quality of services.

The Commission also investigated a number of different types of educational technology and assessed their suitability for meeting differing needs. Information was gathered on alternative technologies such as cable, microwave, fiber optics, videotaping, radio, freeze-frame and electronic blackboards. The Commission recognized the need to avoid duplication of telecommunications equipment and services already owned by Florida educational institutions or other state offices.

Of considerable interest to the Commission was the nature and degree of state-level coordination required by a statewide system. To whom should responsibility for the implementation, operation and scheduling of a statewide system be assigned?

Commission Activities and Methodology

The Committee met in October, December and January in Tallahassee. All meetings were open to the public and the Committee received testimony from governmental offices, postsecondary educational institutions and private parties interested in the proposal. At the third meeting in January, the Committee reviewed a draft report. The Commission took action on the report at the February meeting and the final report was submitted to the Legislature on March 1, 1985.

The Commission surveyed the executive staff of all the Florida public postsecondary education institutions to determine which institutions presently own satellite receiving dishes, to assess institutional interest in the proposed system and the willingness to commit institutional resources, and to identify the type of students or community groups that might utilize such a system.

Staff conducted a review of the experience of other states in the uses of educational technology. The former director of the State Higher Education Executive Officers and Council on Postsecondary Accreditation joint project on telecommunications and the authorization of distance learning spoke to the Commission in October regarding the use of telecommunications for educational purposes, and, in specific, the accreditation issues involved.

The Commission received technical assistance from the several offices involved in educational technology including the Department of Education and the Division of Communications of the Department of General Services. In particular, the Division of Communications was asked to analyze (1) the costs of the proposed system including capital equipment purchase, implementation and other start-up costs, annual operating costs, and (2) the costs of a state-level office charged with implementing and coordinating a system.

II. REVIEW OF THE 1982 COMMISSION REPORT ON EDUCATIONAL TECHNOLOGY IN FLORIDA

The 1981 legislative action which established the Postsecondary Education Planning Commission as a statutory entity charged the Commission with preparing a state master plan for postsecondary education and, in specific, directed the Commission to address the needs for educational technology in the State. As background for the Commission's deliberations, the staff prepared a report in February 1982 which described the different educational technologies available, the experience of other states and educational institutions with these systems, the current uses of educational technologies in Florida and the policy issues of concern to state-level policy makers.

The report defined the term educational technology to include any educational techniques that involved interactions between the student and electronic media designed to supplement the educational process by allowing access to instruction generated in different locations or at various times. The report emphasized the use of educational technology for instructional purposes while recognizing its potential for use in academic and career counseling, data processing, faculty and administrative professional development, and noncredit and community instruction. This chapter includes information and policy considerations from the 1982 report which are pertinent to this report.

Types of Educational Technology

Computers. The report reviewed the educational applications of computers, including mainframes, minicomputers, and microcomputers. Computers are used for storing, retrieving and displaying information as well as for interactive learning. For example, computerized modules for the teaching of mathematics can provide a diagnosis of the learners' capabilities and presentation of new material based on this diagnosis. Each response by the learner can influence subsequent material presented to the learner.

Videotapes. Videotapes can be used to tape classroom lectures or other events to be played at later dates or different locations thus increasing the number of people who can participate in the event. The small size of the tapes permit easy mailing, storing and referencing and the tapes are relatively inexpensive. The disadvantage of taping is the lack of direct communication between the presentors and the students. However, this problem may be reduced through use of on-site facilitators and telephone access to faculty.

Slow-scan Television. Slow-scan television allows any still image which can be captured by a regular television camera to be transmitted over a dial-up telephone line. It can be used to show participants, graphics or objects. Slow-scan television operates by trickling the information that comprises a television image down a narrowband channel and, when the transmission is complete, displaying it on a television monitor. Transmission time is typically half a minute.

The term freeze-frame refers to a modification of slow-scan TV which deals with scenes in which there may be movement. A monitor is watched at the near end; when the image is judged appropriate, it is "frozen" in a local buffer. The frozen, hence static, image is then transmitted, via slow-scan.

Electronic Blackboards. Used like an ordinary chalkboard, chalk strokes are converted to digital data and transmitted from a central location to remote locations over regular phone lines. The audio may be transmitted over another phone line. The technology is limited in that only the written signals are received over the monitor. The instructor or student cannot be seen.

Microwave Transmission. This technology can connect participating institutions with one-way video and/or two-way audio using special frequency network broadcasts. The broadcasts are transmitted on Instructional Television Fixed Services (ITFS) microwave frequencies assigned to non-profit educational purposes by the Federal Communications Commission. A course originates at a production studio, studio classroom, or on prerecorded video tape at the sponsoring institution and is distributed by a control center on microwave frequency to remote locations equipped to receive the transmitted signals. The use of three-cameras (considered the optimum arrangement) allows remote students to view the presentor, the desk and notes or demonstrations, and the classroom students. Two-way audio feedback may be provided through a talk-back telephone that a student uses for direct conversation with the presentor or on-campus students. Such systems provide real time instruction coupled with audio and video interaction. A limitation of microwave is that the signal may travel only a limited distance, often less than 30 miles, and though intermediate antennas may relay the signal, degradation in signal quality is experienced.

Satellite Transmission. Satellite transmission is similar to microwave in that two-way video and audio is possible for real-time transmission. The major difference is the media of transmission. Microwave uses frequencies which are transmitted along line of sight. With satellites, an uplink, located at the point of origination, beams a signal to a communications satellite in a geocentric orbit above the earth which then relays the signal back to the receiving sites that are equipped with downlinks. The advantage of satellite transmission is that the distances for transmission are virtually limitless within the United States. It costs no more to pick up a signal that originated in California than to pick up one down the street. Also, the number of receiving sites is practically unlimited. Satellite channels can be owned or leased but are expensive and only cost-efficient if information is disbursed over a large region and to many receivers. The costs of satellite transmission are considerably higher than microwave thus the number of uplinks or originating sites may limit its application.

Fiber Optics. This most recent of technologies allows for the high-speed movement of information - data, voice, or video over a light wave through hair-thin glass filaments. It is estimated that it could replace conventional copper wiring by the turn of the century. The advantages of fiber optics technology is the huge amount of data that can be transmitted in a relatively short time period. A strand of optical fiber can carry 250 times the capacity of a copper wire and by 1986 the figure will be 500 times. The technology is relatively immature and the cables have not been laid in many areas. However, a number of U.S. companies have committed to vast expansion of the technology over the next few years. In 1980, AT&T had only 4,000 miles of cable and that increased to 200,000 by 1983. Microtel, Inc., has buried cable in Florida between Miami and Jacksonville with a connecting line running from Cocoa to Orlando and on to Tampa. Extensions are planned from Tampa to Naples and from Orlando to Gainesville. The cable is being marketed primarily for high-volume telephone users; however, other uses are possible.

Broadcast Television. Broadcast television is the most widely used medium for postsecondary education off-campus. The size of the potential audience is its single most attractive feature. The audience size is second only to radio and includes the institutionalized and homebound. Economies of scale are possible because of its large size. Moreover, whatever can be offered once by broadcast television can be taped, repeated, distributed to learning centers for replay, altered such as being captioned for the hearing-impaired, and improved by further testing and review. Disadvantages are fixed schedules, limited air time, one-way communication and high initial cost.

Cable Television. Cable technology improves upon open broadcast because of the large number of channels it can accommodate. Present cable capacity is 36 channels and with two cables, a community can receive 72 channels. Because cable technology makes a large number of channels available at low cost, it becomes economically feasible to offer educational television at prime viewing hours and to offer more specialized courses designed for small audiences. Also, cable can be interactive. This system provides a return line from the television set to a computer which can allow viewers to participate in coursework and take multiple-choice tests. Cable can also be offered on a fee basis thus limiting reception to those who have paid tuition. The major disadvantage of cable is the limited number of households who are presently connected to a cable system. At present, it is less than 30 percent, however, estimates are that it may reach as high as 95 percent by 1995.

Student Learning Using Technology. Mediated learning or learning through technology is usually contrasted to direct learning which involves face-to-face interaction with a teacher. In actuality, since the invention of the printing press, education has combined both methods with more time usually spent with books than with a teacher. The possibilities inherent in electronic technologies, however, have increased the potential role of technology in the educational process. Much research has been undertaken to determine how well students learn using the various types of technology and how the learning differs from traditional classroom teaching.

As a result of a host of studies reviewing instructional radio, instructional television, computer-assisted instruction, and computer-managed instruction, it is now generally recognized that students can and, under the right conditions, do learn as well with educational media as with conventional instruction. This is particularly true for subject matter instruction and skills training. For example, studies have shown that correspondence study students do as well as classroom students. There is less agreement on learning objectives that fall in the affective domain such as attitudes, emotions, and habits. A third category, including study habits, critical approaches, and research methods, was once considered difficult to teach through mediated instruction, but that assumption is also now being questioned.

There are undeniably some things technology can do better than conventional instructional techniques. For example, videotaped or televised material can display graphic material such as maps, drawings and close-ups; and allow viewing of important figures and historic events; and permit direct eye contact with every viewer. Because of the number of times a tape can be replayed, extra efforts can be expended to prepare special graphic materials and to refine and edit a lecture. An outstanding lecturer or teacher may be made available to a larger number of students. Lessons can be experienced more than once. Taped

material and computer-assisted instruction allow for self-pacing and convenient scheduling for the student and the teacher. Telecommunications can allow for distance learning, making the time and location as convenient as possible for the student.

The most frequently cited disadvantage to mediated learning is the lack of immediate interaction between student and teacher. The lack of simultaneous feedback can sometimes result in a televised lecture moving too fast and a student becoming increasingly confused. When verbal skills or discussion are paramount, television can be inadequate.

There are certain things that occur in classroom activities that may not be duplicated outside the class such as acquiring an openness to conflicting opinions and new ways of thinking, refining verbal skills and debating, and receiving mutual inspiration and stimulation from fellow students. Teachers often report they miss the personal feeling of satisfaction of face-to-face teaching and the ability to pace their lecture to the audience. Because of the problems encountered with a lack of personal contact between teachers and students, many educators feel that mediated or distance learning is best used to supplement and enhance instruction but is not sufficient as a total delivery system. Often televised courses, for example, require attendance at classes on campus or other sites intermittently. Degree or certification programs sometimes allow only a limited number of credit hours to be earned through mediated learning. The remainder must be acquired through conventional instructional methods.

Increased Use of Educational Technology

The 1982 report concluded that while the use of educational technology will probably increase, the much heralded revolution in educational technology will probably not be realized. There is considerable resistance to such methods and they are unlikely to be embraced wholesale. This is well seen in the history of correspondence studies which have been available for decades, are very inexpensive, are easily accessible, involve no unfamiliar technology (normally, they just involve books), and yet have not been extensively employed. Distance learning and instruction by computer will probably remain the exception for credit instruction. A more likely scenario is the increased application of technologies as they are found to be amenable to specific administrative, instructional or curricular objectives. Presently, educational technologies are most frequently used to enrich and supplement conventional instructional activities. The use of technologies to support rather than supplant conventional education may well continue to be the model for the next decade at least.

State-level Policy Issues

The report concluded with a list of areas in which the State should exert influence and provide leadership to encourage the cost-effective use of educational technologies.

Needs Assessment. There are two types of needs to which educational technology claims to be able to respond. The first is the need to improve the efficiency of education to those already being served. This can be done by improving quality and maintaining or reducing costs. Many experts feel that the

technology will not substantially reduce costs (or that it cannot be depended upon to do so). Thus, it is widely felt that the policy decisions should be based on its ability to improve quality and to avoid future costs.

Second, some proponents of educational technology claim that additional needs exist that cannot be met with traditional delivery systems. In actuality this is very difficult to ascertain. Assessing the needs of presently unserved and underserved clients and assessing the volume of that need remains very imprecise. However, there are strong arguments that for students whose mobility is severely restricted--the handicapped, parents with children at home, people without transportation, and those who live at some distance from institutions offering the desired programs--educational technology may provide the only possible access to postsecondary education.

Costs of Educational Technology. One of the strongest appeals of educational technology lies in its promise to reduce the costs of postsecondary education. It is hoped that through technology more students can be taught by one instructor and personnel costs may be reduced. Educational technology implies the substitution of equipment costs for personnel costs. However, though technology-intensive instruction may replace teachers, it also requires its own type of personnel, such as technicians, courseware managers and other technical assistants. In a recent study undertaken as a Florida STAR grant project, it was found that high cost technological applications such as television and computers may achieve unit costs comparable to or lower than unit costs for traditional instruction but only if used for 15-20 years.

In the use of educational technology, costs are distributed over time in a manner different than with conventional instructional methods. A larger percent of the costs occur prior to the course actually being held. Costs of equipment and increased preparation time for instructors are much higher. In conventional instruction, unit costs or cost per student enrolled in the typical classroom-based course drop very slowly with increases in enrollment. That is, the 150th student adds approximately the same expenses as the 15th. In contrast, once the initial preparation has been made for offering a technology-intensive course, the cost per student declines abruptly.

Need for Coordination and Cooperation. The high costs of educational technology demand careful planning prior to the purchase of equipment because the equipment can be cost-effective only if the volume of use is high. Experience has shown that few institutions produce their own programs. Institutions usually buy or lease instructional material or work in consortia with other institutions.

Cooperation and coordination is particularly important among the various sectors of postsecondary education. While there have been regional arrangements among institutions in the same sector, there has been considerably less cooperation among different sectors. One problem with attempts to share instructional material is institutional parochialism. Material produced by one institution may not be deemed suitable by another institution. This problem needs to be confronted on two levels. First, cooperation and coordination among different institutions in the original planning of the material is necessary so that subject matter and production concerns are resolved at the onset. Second, the materials should be of superior quality. The savings possible with repeated use can justify extensive planning, preparation, editing, and review.

In addition to the need for postsecondary education institutions to share in the purchase of capital equipment and to work more closely in the purchase or production of instructional material, there is a need for closer communication and sharing among all state agencies in the use of educational and information technologies. It is estimated that over twenty different state agencies have educational equipment, in particular, data-transmitting capabilities. Possibilities for cooperation among the public libraries, the different state departments such as Education, Corrections, Transportation, Health and Rehabilitative Services and other state offices need to be explored in a systematic fashion to ensure maximum use of equipment without unnecessary duplication or expense.

The realm of educational and informational telecommunications involves a broad range of private, public, state and local entities. Local broadcasters, community cable operators, non-profit private agencies, private and public educational institutions from K-12 to postsecondary levels, state agencies and private entrepreneurs all own and operate some facilities, they may have services that could be shared by others and may have additional needs that could be met by a pooling of resources. It is important that state and local governmental agencies, nonprofit organizations, private educational institutions and businesses stay informed about each other's activities and that mechanisms be developed to facilitate the sharing of equipment and services.

III. TELECOMMUNICATIONS TECHNOLOGIES CURRENTLY IN USE IN FLORIDA

The State of Florida does not have a comprehensive statewide network employing telecommunications for educational purposes. While a number of institutions have established innovative programs, their outreach has been local and regional in scope. Nonetheless, the experiences of some institutions and the equipment they have acquired relate to this proposal.

Live Video Transmissions

A number of community colleges have satellite receiving dishes. The dishes differ in their technological capacities and in their applications. Pensacola Junior College, for example, has one dish which is part of the Public Broadcasting Service Network satellite system. Brevard Community College has two dishes which have only recently been installed at the Cocoa and Melbourne campuses and are not fully in use yet.

None of the area vocational centers has dishes, although the Division of Vocational Education is encouraging centers with electronics programs to use federal funds to acquire dishes for student training.

The most ambitious project to date has been a television network that was operated by the University of Florida College of Engineering from 1966-1970 to meet the educational needs of the engineers involved in the nation's space program. GENESIS was a closed circuit, two-way audio and video television network that connected Gainesville to remote classrooms in Cape Canaveral, Orlando, Daytona Beach, and West Palm Beach. Lectures given in Gainesville were picked up on monitors at each connecting center. An audio feedback link permitted direct interaction between the professor and students. While the program was academically successful, the $200,000 a month operating costs and decline in demand resulting from the phase down of the space program led to the termination of the GENESIS network in 1970. This has been the only system to date in Florida that has attempted live, interactive instruction over such long distances.

The successor to GENESIS is the Florida Engineering Education Delivery System (FEEDS) developed by the Board of Regents, which uses video tapes primarily. Its purpose is to meet the needs for graduate programming of engineers working in industry. Live courses on campus are video taped and delivered around the State to the FEEDS centers. Each class session is led by a tutor or facilitator. The tape is stopped for clarification and discussion. Students communicate with professors by telephone between classes if clarification of course material is necessary. Although tutored videotaped instruction is the delivery system most frequently utilized, alternative methods are available. Instructional television fixed service (ITFS) is used to teach live classes to students at a remote site; these remote students may participate in real-time with the other class and the instructor. This system is currently being used at the University of South Florida. The particular system in use does have audio-back capabilities, but lacks video-back equipment. It permits low power, one-way microwave telecasting.

The University of South Florida is in the beginning stages of development of an ITFS system (microwave) to link its branch campuses and the main campus. This

system will provide two-way audio and one-way video within the USF service area. A few branch sites are already in operation.

Live Audio Transmission

The State of Florida has not made extensive use of live interactive instruction using just audio. One program was developed in the 1960s but it has been discontinued. The University of Florida Medical Center used audio teleconferencing to instruct Spanish-speaking students in American pharmacy techniques in response to legislation that required foreign-nationals to complete a refresher course before seeking jobs in health related professions in the United States. Lines connecting the Medical Center in Gainesville to several Miami-based locations were installed and classes were conducted solely through voice transmission. Written materials were prepared in advance and distributed to supplement electronically carried lectures. The Education Telephone Network (ETN) lasted until 1973, but was discontinued due to lack of funding.

Valencia Community College has recently acquired a 24-line audio bridge which is being used for college-credit instruction. The bridge is used to connect remote sites such as a student's home or a business site such as Disney World with the instructor. The bridge allows for two-way communication with the instructor and with the other students. Courses that have been taught on the system include Marco-Economics, Micro-Economics and Music Appreciation. The audio-bridge has also been used as an enhancement to instruction using telecourses at remote locations.

Last year, the Leon County School District, in conjunction with the Division of Vocational Education, used federal vocational funds to acquire an audio teleconferencing bridge. The bridge will allow up to forty people to participate in a live conference using regular telephones from any location. The participants simply dial up from their home or business phone and are connected into the conference by the audio bridge. The bridge was bought to support Lively Area Vocational Center's program in telecommunications and the students will train on the equipment. It can also be used for statewide teleconferencing for business, industry and educators.

Telecourses

The most common use of telecommunications for instruction is the presentation of telecourses through cable or open broadcast television. The University of South Florida and Miami-Dade Community College, in particular, have been national leaders in this area, and a number of other Florida postsecondary institutions have offerings as well. Courses are taped and then carried on television networks into people's home. The instruction is neither live nor interactive. Often, the entire course is purchased or leased from another institution which produces and markets them. USF has about 2,000 students enrolled each year in subjects such as biology, Spanish and computer science. Professors keep office hours for students to visit or to place telephone calls.

It does not appear that there are any current telecommunications projects that are similar in scope and objectives to the Associated Industries proposal. No existing activity has a statewide scope involving "real-time" video and audio transmission. However, some of the equipment that would be used in the proposed

system is already in use around the State, notably satellite receiving dishes and audio teleconferencing bridges.

IV. TELECONFERENCING

The community college satellite network system proposed by Associated Industries is primarily a "teleconferencing" system. A brief description of teleconferencing technology and applications would be useful prior to reviewing more closely the Associated Industries proposal.

Teleconferencing refers to two-way electronic communications between three or more groups of people in different locations. Telecommunications channels are used that include regular or dedicated telephone lines and satellite links. The link is interactive giving people an opportunity to participate actively in the meeting. There are four major types of teleconferencing: audio teleconferencing, audiographics teleconferencing, video teleconferencing, and computer teleconferencing. The system under discussion in this report involves audio and video teleconferencing. The following descriptions are excerpted from Teleconferencing Technology and Applications by C. H. Olgen and L.A. Parker.

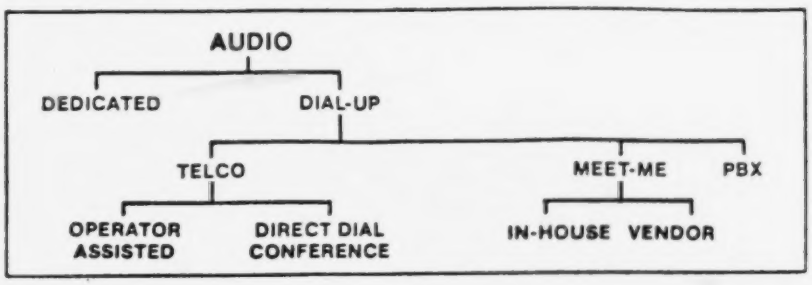
Audio Teleconferencing

Audio teleconferencing is voice-only communication. It links people in remote locations via ordinary telephone lines. Audio systems include telephone conference calls as well as more sophisticated systems that connect multiple locations--from a handful to over 200--via a central bridge that ties all the lines together.

Although audio teleconferencing lacks a visual dimension, it has some major strengths in its favor:

1. It uses a readily available and familiar technology--the telephone;
2. There are about 400,000,000 telephones in the world that can be used for audio conferences;
3. Conferences can be set up on short notice and with less planning than other forms of teleconferencing;
4. It is relatively inexpensive to use;
5. It can interconnect large numbers of locations for a meeting.

There are a variety of approaches that one can take to establish an audio teleconference.



A dedicated network is one in which locations are permanently wired together via leased telephone lines. These systems tend to be large,

averaging 25 sites or more, and the sound quality is generally better than dial-up conferences. They may connect ordinary rooms, or the rooms may be specially designed for teleconferencing.

Dial-up teleconferences use what is known as the public switched network, also called POTS--plain ol' telephone system. It is the network that connects the 400 million telephones around the world.

Most people are familiar with the telephone conference call that is operator-assisted. You dial "0" and ask for the conference operator. You then give the names and phone numbers of the participants and the date and the time of the call. The operator notifies each participant and, when the time for the meeting arrives, calls each individual one at a time to interconnect them. While this system works for a small number of locations, such as six or eight, several difficulties arise when the number increases. It take more time to get everyone on-line, causing waiting periods for those contacted first; noise levels also increase as more sites are added; and people need to be at a predetermined telephone number in order to be reached by the operator.

For these and other reasons, several private companies began to offer a new type of service a few years ago called "meet-me" teleconferencing.

In meet-me conferences, each participant calls a conferencing center. If everyone calls in promptly, a large number of locations can be interconnected and ready to conference in five minutes or less. Because participants initiate the call, it means they can be at any convenient location. This gives people the flexibility to move around, a factor especially beneficial for sales representatives, for example. Meet-me conferences also control noise levels for better audio quality.

Video Teleconferencing

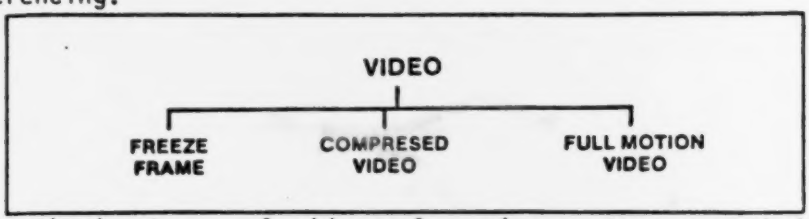
Not only do video teleconferencing systems include voice communication and graphics, they also provide images of people. For many users, pictures of people create a "social presence" that resembles face-to-face meetings. Although video systems are more expensive, they have two major advantages:

1. They show pictures of people so you can see and hear the speaker at the same time;
2. They show three-dimensional objects as well as graphics.

Many people think of video teleconferencing as full-motion color television using broadband channels. That is one type of system, but there are two other options. One of the newest technologies is the video compression codec. It reduces the amount of information in a full-motion color picture so it can be sent over a narrower transmission channel at much less cost. Although the compressed picture looks very much like the original, the technology is not yet perfect and there may be some occasional blurring. Many industry experts, however, predict that it will have a major impact on video

teleconferencing, especially with the improvements scheduled for the next generation of codecs.

Another option is freeze-frame video. It transforms a moving picture into a still, or "frozen," image which can be sent over a regular telephone line. While it can be used for pictures of people, its chief advantage is for showing three-dimensional objects and graphics at a fraction of the cost of full-motion or compressed video systems. Freeze-frame is sometimes called an audiographics technology, but its ability to show pictures gives it an ingredient common to video teleconferencing.



The major disadvantages of videoconferencing systems are their cost and limitations in linking multiple locations.

The higher costs are mainly associated with two factors: more sophisticated rooms and wider transmission channels. Most video-conferencing rooms are specifically designed for that function in order to provide good quality audio and video. Because of the need for greater planning and the addition of video equipment, a typical room can easily cost over $200,000 for a full-motion video system. Most video systems also require greater transmission bandwidth at a corresponding high cost. If satellite channels are used, earth stations must be available.

Unlike systems that use telephone channels, wideband videoconferencing cannot readily link multiple locations for two-way video. In addition, the room and transmission requirements for videoconferencing do not provide the flexibility and convenience of audio systems that can use a telephone in almost any location.

Teleconferencing Applications

The advantages that have been attributed to teleconferencing include reduced travel costs and time savings; shorter and better organized meetings; improved communications and employee morale between a headquarters and branch offices; quick follow-up meetings to pursue previous directives; and increased opportunities for personal training and development. One of the major reasons why teleconferencing has gained more acceptance during the past few years was the dramatic rise in petroleum costs, which thus increased travel costs. Estimates have been offered that teleconferencing could reduce travel by 15 to 25 percent. Of even more importance, however, may be the time savings. It is estimated that 10 percent of a middle manager's time is spent in travel. However, it is difficult to estimate the extent of travel reduction if teleconferencing is available. Figures differ and actual savings are difficult to measure. Furthermore, teleconferencing may not just substitute for traveling, but may create new communication opportunities.

The quality of communication through such technologies is also difficult to evaluate. Research has been inconclusive. Some organizations and people found teleconferencing as effective as face-to-face meetings while others did not. Furthermore, past research has indicated that meetings involving negotiation, bargaining or conflict may be unsuitable for teleconferencing. However, more recent research has questioned this assumption. In addition, inadequacies in teleconferencing experiences may relate more to the inappropriateness of the equipment or design flaws rather than teleconferencing itself. That is to say, different organizational needs may have to be met by different types of equipment.

Human factors may inhibit the use of a system. Lack of familiarity with the equipment and reluctance to change established work patterns have prevented widespread use of some technologies even after they have been put in place.

Video vs. Audio Teleconferencing

Presently audio teleconferencing is used 3 or 5 times more widely than video teleconferencing. It has been estimated that as little as twenty percent of business meetings actually require video. Similarly, freeze-frame video which like audio uses telephone lines rather than the more expensive satellite or microwave transmissions, may be as satisfactory as full-motion systems for many applications. In fact, an internal evaluation conducted by IBM, Ford Motor Company and Exxon determined that freeze-frame video could be used for 80 percent of their teleconferencing needs.

Applications of Audioconferencing by Educational Institutions. Colleges and universities have traditionally used audio teleconferencing, primarily because of its ability to link a large number of locations and its lower costs.

Applications of Teleconferencing by Educational and Governmental Bodies. While much of the teleconferencing technology is new, a number of postsecondary institutions and governmental groups have put systems into place. The following section reviews the experiences of these groups and provides information on their systems.

Many of the first applications were for continuing medical education. This trend continues. Health professions are the most extensive users of such systems. As shown in Table One, other applications exist, however. Continuing professional education is the most frequent programming offered in higher education followed by administrative meetings and credit instruction to remote students.

Applications of Video Teleconferencing by Educational Institutions. Though business and industry is the major user of video teleconferencing, educational institutions are counted among the earliest users. Universities and colleges were involved in initial research and development of the technologies. Currently, educational videoconferencing systems are used on a local, regional, or statewide basis. None are national systems, although the organizations participate in national videoconferencing events sponsored by other organizations.

The technologies used for video teleconferencing include closed-circuit television systems transmitted by either cable or microwave and satellite.

While most businesses have opted for two-way video systems between two locations, educational applications tend to have one-way video and two-way audio networks for point-to-multipoint programming.

The audience for educational programming differs among different systems as Table Two shows. In several systems, programming is offered in credit and noncredit instruction, for K-12 and higher education, for vocational and professional education, for staff training, and for administrative meetings. The largest full-motion video systems connect about 30 locations. They include the Health Communications Network in South Carolina, Irvine Interactive Television Systems, and the Alaska Instructional Communications Consortium. The largest freeze-frame video system is operated by the University of Wisconsin-Extension and connects 26 locations. See Table Two.

Applications of Audio Teleconferencing in Government. Most audio teleconferencing systems in government are used for administrative and staff meetings. The majority use audio teleconferencing to facilitate meetings among geographically dispersed offices and to reduce travel costs. Another use is training. For example, the California Department of Health Services provides educational programs to laboratory personnel at public health facilities through audio teleconferencing. See Table Three.

Applications of Video Teleconferencing in Government. The use of teleconferencing is not widespread in government, though the applications have been diverse including management meetings, continuing education, direct patient care, police arraignment, research and system designs, public hearings, and crisis intervention. Videoconferencing is more common than audio teleconferencing for government use. See Table Four.

TABLE ONE

AUDIO TELECONFERENCING

APPLICATIONS IN EDUCATION

Organization	Type of Media	Audience	Type of Programming	Number of Sites
Georgia Hospital Association	Telnet System: Dedicated Network of four-wire telephone lines	Health Care Professionals Hospital Personnel	Continuing Educ. Programs; Symposia; Administrative Meetings	90 Hospitals
University of Nevada-Reno-Division of Continuing Educ.	Unite System: Darome Convertor with Press-to-talk microphone and tape recorder connection	All State Residents	Continuing Educ. Programs; Recertification; Relicensure.	Public Schools and County libraries in 16 communities.
University of Illinois Cooperative Extension Service	Telenet System:3 dedicated networks of four-wire telephone lines	County and Regional Extension Offices	Agricultural and Consumer Education. In-Service Training Continuing Educ. Specialized workshops	90 State locations.
University of Texas Health Science Center	Dedicated Network	Health Care Professionals and Hospital Personnel	Continuing Education Programs	90 Locations
University of North Dakota School of Medicine	Dedicated Network Plus a Meet-me Bridge for Dial-in Capability	Health Professionals	Continuing Education; Credit Classes; Admin. Meetings	60 Sites
Cincinnati Center for Developmental Disorder	Meet-me Bridging Service	Health Care Professionals	Training for People Working with Developmentally Disabled	8 University Facilities in Multi-state Region & Canada
Colorado Association of Continuing Medical Laboratory Education	Meet-me Bridging Service	Medical Lab Personnel	Continuing Education Program	25 Locations
Eastern Montana College	Dedicated Telephone Lines Plus Meet-me Bridging System	All State Residents	Continuing Education; College Credit Courses.	32 Sites; Meet-me Bridge-20 Sites.

Organization	Type of Media	Audience	Type of Programming	Number of Sites
Hospital Shared Services Inc., Oklahoma	Dedicated Network	Health Care Professionals	Continuing Medical Education	25 Sites in NW Oklahoma
Illinois Institute for Continuing Legal Education	Dedicated four-wire Network	Lawyers	Continuing Education	30 Sites
Indiana Higher Education Telecommunication System	Meet-me Bridging Facilities	State Educators	Administrative Meeting; College Credit Courses; Press Conferences.	All State Post-secondary Institutions.
Iowa Council of Area School Boards	Dedicated four-wire Network	State Educators	2/3 Administrative Meetings; 1/3 Instruction (credit and non-credit)	17 Community Colleges
Kansas Regents Continuing Education Network	Dedicated four-wire Network	All State Residents	Continuing Education Programs College Credit Courses	34 Sites
Medical Products Systems Inc.	Dedicated Network	Allied Health Professionals	Educational Programming; Meetings	120 Hospitals in Oklahoma and Kansas
Memorial University of Newfoundland	Dedicated Network	All Residents	Continuing Educ.; College Credit Courses; Committee Meetings.	34 Towns
Michigan Judicial Institute	Meet-me Bridging Service	Judge	Educational Programs	----------
Ohio State University	Custom-built, Dial-up System	Physicians	Continuing Medical Education	145 Sites in 14 States and Canada.
Penn. State University	Dial-up System and WATS Line	Health Professionals	Continuing Education	61 Hospitals
Purdue University	Dial-up System and WATS Line	State Education	Continuing Education; In-service Training	45 Sites

Organization	Type of Media	Audience	Type of Programming	Number of Sites
State Bar of Arizona	Dedicated Audio Network	Judges and Lawyers	Continuing Education	17 Sites
Syracuse University	Dial-up System	State Educators	In-service Training	8 Locations in 4 States
Texas Hospital Association	Dedicated Network	Hospital Personnel	Continuing Education	38 Hospitals
Trinity University	Meet-me Bridging Service	External Masters Degree Students	Health Care Administration Courses	Open
University of Calgary	Dial-up System	All Residents	Credit Courses; Continuing Education	22 Sites
University of Minnesota Agricultural Extension Service	Meet-me Bridging Service	County Extension Offices	Educational Programs Meetings	92 County Offices
University of Missouri	Meet-me Bridging Service	State Educators	Continuing Education; In-service Training; Administrative Meetings.	20 Sites
University of Nebraska Medical Center	Dial-up System	Health Care Professionals	Continuing Education	75 Hospitals, 7 States
University of New Brunswick	Meet-me Bridging Service	Residents	Continuing Education	10 Locations
University of Quebec	Dial-up System	All Residents	Credit Classes; Continuing Education	Open
University of Regina	Dial-up System	All Residents	Educational Classes	Open
University of South Dakota School of Medicine	Meet-me Bridging Service	Health Care Professionals	Continuing Medical Education; Admin. Meetings	20 Health Care Facilities
University of Southern Maine	Dedicated four-wire Network	Health Care Professionals	Credit Courses; Continuing Education; Meetings	30 Sites

Organization	Type of Media	Audience	Type of Programming	Number of Sites
University of Washington	Dedicated Network	State Residents	Continuing Education	23 Sites
Utah State University	Dial-up System	Extension Offices	Administrative Meetings; In-service Training	10 Offices
Valley View Hospital, Oklahoma	Dedicated Network	Health Care Professionals	Continuing Education	120 Hospitals
West Virginia University School of Nursing	Dedicated Network	RN's	Continuing Education	30 Hospitals

Source: Adopted from Olgren, C.H., and Parker, L.A. Teleconferencing Technology and Applications.

TABLE TWO

VIDEO TELECONFERENCING

APPLICATIONS IN EDUCATION

Organization	Type of Media	Audience	Type of Programming	Number of Sites
Central Main Interactive Telecommunications System	Microwave Channels, Full-motion Video Interactive Equip.	Health Care Professionals	Continuing Education; Credit Courses; Meetings.	7 Institutions
Aroostock County Telecommunications System, Maine	Freeze Frame Video Equip., Dedicated Telephone Lines	Health Care Professionals	Continuing Education, Credit Courses	5 Hospitals
Irvine Interactive Cable Television Service	Two Public Access Channels for Two-way Audio and Full-Motion Video Applications, or One-way Video to Multiple Sites.	Educational Personnel, State Agency Staff, Students	Educational Programming; Admin. Meetings; Special Presentations	30 Sites
Medical University of South Carolina	System of Closed Circuit and Broadcast T.V., Radio, Dedicated Teleconferencing Networks, and Satellite Links. Five Sites Have Two-way, Full Motion Video. Uses a Leased Microwave and Cable Transmission System.	Health Professionals and Students	In-service Training; Continuing Education; Meetings	31 Hospitals
Alaska Instructional Communications Consortium	Two-way Audio, Full-motion Video and Computer Conferencing	State Residents	Educational Programs	30 Locations
Appalachian Community Service Network	One-way Video with Audio Interaction	Region Residents	Public Service and Educational Programming	Open
External Degree Program, California State University at Chico	Freeze Frame Video System of Two-way Audio and Video	Students and Staff	Credit Course Instruction	One Site

Organization	Type of Media	Audience	Type of Programming	Number of Sites
Dartmouth Hitchcock Medical Center	Microwave System of Two-way Audio and Full-Motion Video	Health Professionals	Continuing Education	12 Institutes a 7 Locations
Kirkwood Community College	Microwave System of Two-way Audio and Full-Motion Video	Adult Learners	College Transfer Program Continuing Education Vocational Training	8 Locations
Louisiana Educational Television Authority	Closed Circuit Cable for One-way, Full-motion, Video and Two-way Audio	Health Professionals	Continuing Medical Education Programs	9 Locations
Ohio University College of Medicine	Microwave System for Full-motion Video	Health Professionals	Continuing Medical Education	6 Sites
Rio Salada Community College	Freeze-frame Video; Meet-me Bridging System	Area Educational Personnel	Evaluation of Educational Applications	4 Sites
University of Arizona	Microwave System-Freeze-Frame Equip. Operates Over Dial-up Telephone Lines.	Students-Staff	Credit Courses	2 Locations
Medical Center Libraries of University of Cincinnati	Freeze-frame Equip. and Video Hard Copiers	Health Care Personnel	Medical Information	4 Ohio Hospitals
University of Hawaii	Freeze-frame Video	Students-Staff	Credit Courses; Special Presentations	Inter-island
University of Toronto	Freeze-frame Video	Health Care Personnel	Educational Programming; Medical Consultation	8 Facilities
University of Wisconsin Extension	Freeze-frame Video; One-way Video and Two-way Audio	Educational Staff-Students	Continuing Education, Administrative Meetings	26 Locations

Organization	Type of Media	Audience	Type of Programming	Number of Sites
Western Communications Cooperative	Cable System: Two-way Audio and Full-motion Video	Regional Residents	Public Instruction; Teacher Education	8 Public School

Source: Adopted from Olgren, C.H., and Parker, L.A. Teleconferencing Technology and Applications

TABLE THREE

AUDIO TELECONFERENCING

APPLICATIONS IN GOVERNMENT

Organization	Type of Media	Audience	Type of Programming	Number of Sites
Canadian Government Telecommunications Agency	Shared Dedicated Network; Northern Telecom Bridge System	All Federal Government Departments and Personnel	Administrative Meetings	Nationwide Service to 25 Federal Dept.
National Radio Astronomy Observatory	Commercially-operated Meet-me Bridging System	Observatory Personnel	Daily Communications	4 Locations
University of Southern Maine and Maine Rehabilitation Service Admin.	Dedicated Network	Vocational Rehabilitation and Human Services Personnel	Administrative Meetings; Daily Comm. and Information Exchange	20 Offices
California Department of Health Services	Dial-up System with Portable Units	Public Health Laboratory Personnel	In-service Training	44 Facilities and Hospitals
Idaho Dept. of Health and Welfare	Dial-up System	Public Health Laboratory Personnel	Continuing Education	49 Hospitals
Institute for Court Management	Three-way Conference Calls	Judge and Attorneys	Preliminary Hearings	Open
Tennessee Valley Authority	On-premises Conferencing System and Portable Unit	Regional Offices and Power Plants	Administrative and Problem Solving Meetings	5 Locations
U.K. Civil Service Department	Dedicated Network	Department Staff	Administrative Meetings	11 Locations
U.S. Department of Agriculture, Science, and Education Office	Private Meet-me Bridging System	Department Staff	Administrative Meetings; In-service Training	4 Regional Offices
U.S. General Services Administration	Dial-up System	Any Federal Government Agency	Administrative Meetings	Nationwide Service

Organization	Type of Media	Audience	Type of Programming	Number of Sites
Wisconsin Board of Vocational, Technical, and Adult Education	Dedicated Four-wire Network and Portable Units	Agency Staff	Administrative Meetings	20 District Offices

Source: Adopted from Olgren, C.H., and Parker, L.A. Teleconferencing Technology and Applications.

TABLE FOUR

VIDEO TELECONFERENCING

APPLICATIONS IN GOVERNMENT

Organization	Type of Media	Audience	Type of Programming	Number of Sites
Commonwealth of Virginia, Dept. of Telecommunications	Public Broadcasting Service of One-way Video Via Satellite, Interactive, Audio by a Meet-me Bridge. Two-way Audio and Video Connected by a Closed-Circuit Microwave Channel	State Government Agencies	Administrative Meetings, Continuing Education	5 Sites
Nebraska Veteran's Administration	Two-way Full-motion Video. A Dedicated Network of Leased Cable and Microwave Channels.	Health Care Personnel	Educational Programming, Administrative Meetings	10 Hospitals
City of Philadelphia Police Closed Circuit Television	Duplex Cable System with 28 Operating Channels. Self-contained Video Phones.	Police Personnel	Decentralize Arrangnment of Arrested Persons; Have witnesses identify suspects; Show Training Tapes; Dispense General Information	All Police District Offices
Health Care Financing Administration	Freeze-frame Video; Electronic Blackboard; Meet-me Audio Bridging	Health Care Personnel	Management meetings; Policy Decisions; Training; Information Dissemination.	12 Sites
Jet Propulsion Laboratory	Freeze-frame Video System	Engineers; Scientists	Design Reviews; Problem Solving; Information Exchange	Link to NASA Headquarters
Ministry of Government Services, Ontario	Two-way Video and Audio Facilities	Government Departments		4 Sites

Organization	Type of Media	Audience	Type of Programming	Number of Sites
National Conference of State Legislatures	Two-way Video and Audio	Legislators-Staff	Meetings	Periodic, Selected use
North Carolina Agency for Public Telecommunication	Freeze-frame Video System	All Public Agencies	Meetings	2 Sites
Oklahoma Public Welfare Commission	Full-motion Video System. Two-way Video-15 Sites; One-way Video-55 Sites.	All State Agencies	Communications Among State Agencies and the Public	15 and 55 Sites
Rockford Fire Department, Michigan	One-way Full-motion Video System	Fire Department Personnel	Training	4 Stations
Stanford Linear Acceleration Center	Microwave Channels for Two-way Audio and Video	Scientists	Discussions of High Energy Physics	2 Sites
U.S. Dept. of Energy	Black and White, Full-motion Video System. Color Freeze-frame System.	Management and Research Teams	Administrative Meetings	2 Sites
Berks Community T.V. System, Pennsylvania	One-way Video, Two-way Audio System	Senior Citizens-Local Government Officials	Educational Programming; Public Meetings	2 Sites

Source: Adopted from Olgren, C.H., and Parker, L.A. Teleconferencing Technology and Applications.

V. ANALYSIS OF THE PROPOSED COMMUNITY COLLEGE SATELLITE NETWORK

Proposal by Associated Industries

Associated Industries of Florida has proposed that the State of Florida establish a community college satellite network. The network would provide for a satellite receiving dish, or downlink, at each of the 28 colleges around the State. Programming transmitted from any satellite in the western hemisphere could be received on the downlinks. The proposal does not provide for satellite transmission.

The second component of the system is an interactive audio capacity. This technology, called an "audio-bridge", allows the people at different sites to talk to each other using standard phone lines. This component operates separately from the satellite transmissions and could be used independently. However, when used with the satellite transmission, the timing is synchronized. The audio bridge may either be purchased or used on a fee for service basis.

The third component is the display systems at the 28 colleges. Associated Industries proposes that each site be equipped with two 50-inch projection televisions.

Associated Industries also suggests that a turnkey operation be specified so that the installation and systems testing would be finalized before the State assumes ownership, that spare parts and depot repair maintenance be contracted for, that a central booking agency be responsible for the reservations of blocks of time for State and private users and that all users pay a system and per location fee.

The Associated Industries proposal specifies particular equipment built and installed by private companies and these companies' products were used to estimate the cost. However, Associated Industries understands that any purchasing by the State would go through the competitive bid process. The complete text of the proposal is Appendix A.

Analysis of the Proposed System

As proposed by Associated Industries the system would provide a number of services to the educational community in Florida and state and local governments. At the local level, the institution could receive transmissions from any of the existing satellites in this hemisphere. Fees vary for different programming; some are free. The institution would also be able to participate in special events programming which may be transmitted over satellite on an ad hoc basis. These same opportunities would be available for the community-at-large. In particular, community organizations and businesses or industries that wish to participate in some programming opportunity could schedule use of the college facility and their members would meet at the site. Most local sites could not originate programming because they are not equipped with uplinks.

As envisioned by Associated Industries, production and transmission of programming is possible at the state level. Programming could originate live from cities that have uplinks and be received at the other sites. As shown in Table Five and in Figure One, Tallahassee, Orlando and Miami have uplinks, Tampa

will have one by April 1985 and the University of Florida at Gainesville is trying to secure funds to purchase one. The one-way video and two-way audio format would be particularly suitable for state agency heads to hold meetings with personnel in regional offices or for legislators or cabinet members to address constituent groups.

Educational programming would be feasible with this system. Educational programming could be produced and distributed within Florida. From the experience of other States, one can predict that the largest use will be for continuing professional education, particularly in the health areas. The University of Florida, the University of Miami, Florida State University, and the University of South Florida have the largest number of graduate and professional programs and are or may be soon located in cities with uplinks. Certain kinds of educational programming are already available via satellite on a national basis. Under this system, the local institutions could receive such programming for interested people in their service region. One recent initiative is the National Technological University (NTU) which is a consortium of engineering schools. The parent organization is A.M.C.E.E. which provides continuing education for engineers. Courses are offered on video cassettes which are distributed to the participating institutions. Approximately fifteen engineering schools contribute course material and a Master's degree entailing 30 semester hours of coursework is offered. NTU plans to convert to satellite delivery by June 1985.

Other educational uses besides course instruction may be more feasible with this system. Special events programming, such as a lecture by a renowned specialist in a given area, cultural events programming, a current events program such as a live address from a Florida Congressman in Washington, can be used to supplement and enhance regular instruction. Another promising application centers on staff and faculty development and training, particularly in fast changing fields of professional and vocational education.

The system is probably not suitable for instruction of commonly offered postsecondary education courses. The costs of leasing satellite time for forty-five hours a semester is prohibitive, plus the scheduling of that many hours would be difficult to coordinate at a number of different sites. However, for supplemental uses or in cases where other instructional options are not available, satellite transmission is an effective option.

Associated Industries estimates that to equip 28 sites with the necessary equipment will cost $651,797. At the request of the Commission, the Department of General Services (DGS) conducted a cost analysis and produced a similar estimate, $673,298. DGS also estimated the cost of maintaining the equipment and the operating costs. Assuming 10 hours of use per month, DGS calculated that maintenance costs would be $230,516 per year and the operating costs $130,800 per year for a yearly cost figure of $361,316. The cost for one college or site would be $12,904. These costs are detailed in Appendix B. It should be stressed that the operating figures are estimates based on an assumed level of service. As the network is publicized and usage increases, the costs for operation and maintenance should be covered through system and user fees. The system fee would be charged to the group or agency wishing to transmit programming through the network. Site fees which would offset such costs as facility usage, equipment, staff time and programming costs, would be assessed to organizations arranging to use the local facility. In some cases, these

TABLE FIVE

SATELLITE TRANSMITTING DISHES (UPLINKS)
IN THE STATE OF FLORIDA
1985

Region	City	Use
I	Tallahassee	1 Commercial
		1 Public
II	Gainesville	1 Proposed at U.F.
	Ocala	1 Private
III	Orlando	1 Commercial
IV	Tampa	1 Commercial (to be operational April 1985)
V	Miami	1 Commercial
		1 Public

Source: Public testimony to Commission, 1984-85.

FIGURE ONE

STATE OF FLORIDA

Satellite Dishes by Region

Source: Institutional Survey Conducted by Commission Staff, 1984.

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would be the same group. Potential resources for covering operating costs include federal, state, local, and corporate funds for personnel training, private funds and FTE generated instructional support. DGS also estimates the cost of maintaining a state-level office for the implementation and coordination of the system. The cost was estimated to be $56,000 annually for one and one-half professionals and a support person half-time.

The use of portable uplinks by major market television stations in the State is increasing. Commercial stations in the cities of Miami, Tampa, Orlando, and Jacksonville have agreed to develop a cooperative news network. The stations are purchasing portable uplinks in order to share programming feeds and exchange regional news stories. The increased number of portable links in the State may enhance the opportunities for institutions without access to permanent uplinks to transmit programming.

Two costs of utilizing the system were not included in the figures above: use of auditoriums for the participants and programming production or lease. Most institutions have auditoriums on their campuses and presumably they could be made available for instructional use free of charge or a fee could be assessed for private users. Programming costs may vary widely. Providing truly professional quality instructional programs can be very costly. However, such costs can vary from event to event.

Associated Industries of Florida claims that such a system could dramatically reduce travel costs for the State. A review of existing research on teleconferencing suggests that travel cost reduction may occur but it cannot be assumed to do so. Teleconferencing may enable more meetings, more people to attend meetings, and more locations to be connected to the meeting site, thus improving the quality of communication but it may not reduce current levels of travel significantly. An analogy may be drawn with the introduction of computers into information management. Computers did not appreciatively reduce the number of employees needed but did improve significantly the amount and quality of information available.

Needs Survey of Postsecondary Educational Institutions

The state community colleges, area vocational education centers, and universities were surveyed by the Commission staff to determine what equipment was already in place on the campuses around the State and to assess actual or estimated need for teleconferencing services. In addition, the institutions were asked to submit any general observations on the proposed system that might be of benefit to the Commission in its deliberations. Of the twenty-five community colleges that responded to the survey, seven are already equipped with satellite dishes. One dish at Pensacola Junior College does not seem suitable to the uses of the proposed network. Brevard Community College has two dishes for two different campuses. None of the area vocational centers that have responded have satellite dishes. The survey also revealed that there are three existing satellite dishes and one dish to be installed in the State University System. The dishes at the University of Florida and the University of South Florida may not be suitable for the system. See Table Six. Of the total of 12 existing dishes, nine appear to be suitable for use in the system.

Figure One shows the geographic placement of the existing dishes within the five Department of Education planning regions. According to the survey, a large

majority of the institutions that do not have receiving dishes recognize the potential of a statewide system of telecommunications, especially the smaller, less urban campuses. Most were able to identify specific needs for such a system and were generally supportive of the proposal as presented by Associated Industries.

A number of the community colleges that currently operate a system of telecommunications appear to possess considerable knowledge about satellite technology and its application to education.

On the eleven identified campuses, there exists a wide range of systems and programs. For example, the earth station at Pensacola Junior College supports the PBS network satellite system and has averaged two teleconferences a year during its operation. The satellite dish cannot be adjusted to receive signals from different satellites. Daytona Beach Community College uses its system primarily for non-credit continuing education, adult basic education, and compensatory education. Their programming is facilitated by the use of a conference center with a large screen projector which allows one-way visual and two-way audio capability. The south campus of Miami-Dade Community College is equipped with satellite receiving capacity and future plans call for a microwave video interconnect among all four campuses so that the satellite dish on the south campus will be able to provide signals to any of the other campuses. See Table Seven for a description of the receiving dishes at each campus.

A significant majority of the institutions responding indicated that the proposal was both feasible (64%) and needed (59%). However, a number, while generally indicating a positive response, noted areas of concern. The issue of state level coordination was repeatedly raised and the responsibilities of planning, implementation, and scheduling were identified. The institutions that addressed this issue recognized need for an effectively administered, well organized central coordinating office.

A number of community colleges expressed concern in regard to the financing of a statewide system of telecommunications. Many administrators indicated that they would be unable to commit local funds for the operation and maintenance of such a system and expressed the view that the project should be funded on a continuous basis at the state level. A minority of colleges, primarily those without satellite dishes, identified more general reservations, including the view that resources could be better utilized to meet the particular needs of each campus, and that students would be better served by contemporary audio-visual materials. A few respondents urged the investigation of existing commercial satellite systems in the private sector in Florida in order to identify potential cooperative arrangements.

Some of the larger universities indicated interest in availing themselves of the proposed system to transmit continuing professional education particularly in the areas of health and agriculture. Other anticipated applications included academic programming, private business use and broadcasting collegiate football games. A number of cautions were voiced by some university administrators. Concern was expressed that satellite transmission was too expensive to be used for academic instruction, and that if the system is to be successful, funds would be needed for promotion and for personnel training.

TABLE SIX

SURVEY OF SATELLITE VIDEO RECEIVING DISHES (DOWNLINKS)
AT POSTSECONDARY INSTITUTIONS IN FLORIDA
1985

Region	Institution	City	Capability
I	Gulf Coast Community College	Panama City	Articulating Dish[a]
	Pensacola Junior College	Pensacola	Dish Fixed at Westar IV Satellite
	University of West Florida	Pensacola	Articulating Dish
	Florida State University	Tallahassee	Articulating Dish
II	Lake City Community College	Lake City	To be installed
	University of Florida	Gainesville	Dish Fixed at Westar IV Satellite
III	Brevard Community College Cocoa Campus	Cocoa	Articulating Dish
	Melbourne Campus	Melbourne	Articulating Dish
	Daytona Beach Community College	Daytona Beach	Articulating Dish
IV	Edison Community College	Fort Myers	Articulating Dish
	University of South Florida	Tampa	Articulating Dish
V	Miami-Dade Community College	Miami	Articulating Dish

[a]Note: Articulating Dish - refers to the capability of the dish to be directed at different satellites.

Source: Institutional Survey conducted by Commission Staff, 1984-85.

TABLE SEVEN

SATELLITE RECEIVING DISHES AT POSTSECONDARY INSTITUTIONS

Pensacola Junior College

The earth station is fixed at Westar IV to receive public broadcasting programming. It cannot be adjusted to receive signals from different satellites. For the past four years, the system has averaged two teleconferences a year.

Gulf Coast Community College

The college has two satellite dishes. One dish is used for the campus radio station and receives national and international programming from public radio. A second dish is for the Health Sciences and Technology Division for instructional purposes. It is used for special programming. For example, recently a live program from Minneapolis for teaching vocational education was received on this dish. It is also used for teleconferencing, management programs, and C.A.D. programs.

Lake City Community College

An earth station has been purchased but is not installed. Its anticipated use will be in conjunction with the college I.T.F.S. system.

Daytona Beach Community College

The college has one satellite dish. It is used to supply programming for campus-wide distribution. There are 100 outlets throughout the campus. The system stays on C-SPAN primarily and responds to specific requests from faculty for other programming, such as foreign language programming. The dish has been used for teleconferencing in computer graphics, medical transcription, nursing, C.A.D., and photography. Four teleconferences have been held and one is now being scheduled.

Valencia Community College

The college does not have a satellite dish. However, it is trying to obtain funds to connect with an I.T.F.S. system.

Edison Community College

A satellite dish is used exclusively by the electronics department which conducts advanced communications classes. The dish is in use approximately six hours a night for two terms. At this time, no other unit on the campus is using the system. Staff is currently writing a proposal to develop a system that would connect the three campuses by using existing cable company cables.

Miami-Dade Community College

On the South campus for the past three and one-half years the college has operated its own cable channel with access into 35000 homes in Southwest Dade County. This cable channel has served approximately 1500 students enrolled in

college-credit TV-based courses. The operating budget to support the cable channel was approximately $50,000 for the first three years. During the last four months the cable channel has been operating essentially as a character generated bulletin board service with a half-year operating budget of $5,000.

As a part of its arrangement with the cable company, the college has access through the three satellite dishes on the South campus to any cable signal that the cable company is not utilizing as part of their service.

One of the satellite dishes is adjustable to aim at any satellite for which the college is licensed to obtain a signal.

Future plans are for a video interconnect among the four campuses so that the satellite dishes on the South campus would be able to provide signals to the other campuses. The cable channel may be upgraded in the future when more TV-based courses would be offered to serve direct credit instruction. The capital investment requirement was approximately $20,000 to put in the college's head-end cable outlet.

Brevard Community College

The college has two satellite dishes: one on the Cocoa campus, and one on the Melbourne campus which was a gift from the Harris Corporation. The dishes have been obtained in the past year. One of the dishes is set on SATCOM 3, although it is being used very little at the present time. A campus closed-circuit system is currently being completed. Anticipated usage would be two programs a week.

University of West Florida

The University of West Florida has one satellite receiving dish located on its main campus. The dish does articulate. At present, the dish is not being used.

Florida State University

Florida State University plans to have a satellite dish installed in February 1985 to be located at the F.S.U. Conference Center and will be connected to the meeting rooms, each of which is equipped with television monitors. F.S.U. has held eight teleconferences in the past two years using portable downlinks.

University of Florida

The University of Florida has three satellite receiving dishes. Two are used for audio reception only and the third is fixed on Westar IV and does not articulate.

University of South Florida

The University of South Florida has a satellite receiving dish located on its main campus in Tampa. The dish does articulate.

Although there are no satellite dishes at any of the area vocational centers, a number of these respondents were enthusiastic about the future potential of a statewide system for providing educational programming to a wide variety of student populations. In addition, it was recognized that a satellite system would be very useful in the standardization of programs, task listings, resource materials, and in program revisions.

In the survey, the postsecondary institutions were asked to indicate which community groups had indicated interest in the type of educational meeting opportunities offered by this system. The institutions responded that governmental agencies such as HRS or local governmental groups had indicated the most interest followed by educational and business groups. Health care and social service agencies had also indicated significant interest.

VI. CONCLUSIONS AND RECOMMENDATIONS

The proposed satellite network offers a number of educational and service opportunities for the State of Florida. At the local level, access to programming already available on satellites would provide a service to education and to other community and business concerns. At the state level, a network would allow for statewide audio or video teleconferencing for the use of educational institutions, state agencies or the private sector. There is no comparable telecommunications system available in Florida. The system might help reduce state travel costs and would provide a means to improve the quality of communication within the State. Florida, more than many states, could profit from a technology where distance is not a cost factor. Distances within Florida are extensive, the state capital is located at one end of the State, and a number of universities are not located in major population sites.

The type of technology proposed is of a quality high enough to assure reliable performance and flexible enough to adapt to a number of different uses and price ranges. Satellite transmission is reliable and the quality of the video and the audio is very good. Satellite transmission is expensive but this system does not commit the State to a purchase of either a transponder or a set amount of satellite time. Instead, the proposal suggests the lease of satellite time on the basis of need. The purchase of satellite time would have to be built into the programming costs. The system does call for the purchase of downlinks. However, they are relatively inexpensive. The system is flexible in that it permits statewide programming while allowing local usage of the equipment. Also, the two-way interactive audio component is independent of the video component and can be used in isolation for events not requiring video. Indeed, audio teleconferencing would probably be used more extensively than video. While it is difficult to estimate the exact volume of use of the system, technically, the design is flexible enough to encourage use by the public and private sectors at the local and state level. Information from educational institutions and other state governments indicates that similar systems in other places have served the needs of certain groups.

The Commission reviewed other technologies that might be suitable for such a system. In particular, fiber optics was analyzed as a potentially feasible option. However, the equipment is not presently widespread in Florida and usage is prohibitively expensive. However, over the next decades, such a technology may prove to be of equal or greater utility than satellite technology. Therefore, the Commission believes it is important that the State's capital investment should not overly commit the State to one sole technology.

One advantage of a satellite network is that a considerable amount of equipment is already owned by postsecondary educational institutions. No state-level inventory of these resources has been maintained. However, the Commission's survey of the institutions revealed that at least 12 institutions around the State already have satellite video receiving dishes, ten of which appear suitable for use in the system. Other pieces of equipment used in the system are also owned by various institutions. An analogy can be made with computing technology where school districts and public postsecondary education institutions developed computer support systems designed to fulfill their individual needs for administration, instruction and other computing services. The State established the Florida Information Resource Network (FIRN) to provide a compatible link among the resources that are for the most part already in

place. FIRN might serve as a model for the satellite system where the equipment is locally owned but is also part of a statewide system. For the satellite system, there would be need for assessing the suitability of the existing resources and deciding if and where additional resources are to be added to complete a viable system. A central office would be needed to carry out these functions and other operational functions such as coordinating scheduling and programming, providing technical assistance to the campuses, promoting use of the system and establishing fee schedules.

At the same time, it is clear to the Commission that if a community college or any other public educational institution is to become part of a statewide system responsive to requests for access from business, industry, the general public, and the educational community, there will be associated operating costs which should not detract from their current budgets for educational programs. It has been suggested that user fees will cover this added responsibility. However, it has also been acknowledged that there will probably be a transition phase of a year or more before the enterprise is in a position to cover its operating costs.

Furthermore, though a majority of postsecondary institutions indicated interest in such a system, several campuses did not support the proposal. Placement of dishes at these latter sites without a local expression of support does not appear to be an effective use of resources. In such cases, alternative postsecondary education sites in the community college region should be explored.

Based on the information and conclusions noted above, the Commission makes the following recommendations.

Feasibility of a Statewide Satellite Network

The Commission finds that the establishment of a statewide network using satellite technology is feasible and that the system should be set up on a regional basis. The 28 community college service regions provide full coverage to most of the State's population and would be well suited for use for this system. The initial plan should call for implementation of 28 sites. One important advantage in doing so is possible reductions in cost for the equipment by negotiating a volume purchasing package with a vendor. The advantages of broad coverage need to be balanced against the additional costs of multiple sites.

Using a regional approach, it is important that the institutions within a region coordinate their use of telecommunications equipment. The system should not be limited to community colleges. It is the community college region that provides a framework for access, but any postsecondary institution within the region is a potential host for the system. Downlinks are already situated at other institutions and any postsecondary educational institution could make programming available to administrators and students of other institutions in the region. Institutional sharing is particularly important because telecommunications is often used to offer specialized or unique programming which may only be of interest to a limited number of people. Drawing participants from a large pool helps contain the cost per participant. In addition, institutional commitment will be a critical component to the success of the network.

1. A satellite network system should be developed to provide regional access for all of Florida's citizens. A fully implemented system should provide access in each of the 28 community college service regions. The statewide network should not be limited to community colleges. All public postsecondary institutions should be considered as potential sites for placement of satellite receiving dishes.

Statewide Management. A state level office should be assigned responsibility for coordinating effective use of the existing equipment and deciding if and where additional equipment is needed to enhance statewide coverage. This office would be responsible for developing policies and procedures for a statewide network including assessing need for additional equipment; distributing funds for the purchase of equipment or for maintenance, publicity and other expenditures; working with the institutions to coordinate and schedule statewide teleconferencing events; publicizing the system to potential users; and providing assistance to the institutions. It is essential that this office, with technical assistance from the Department of General Services, approve equipment expenditures to assure that the network components are compatible. A state office can also allow the option of a negotiated statewide purchasing agreement which would be the most cost effective approach and a system-wide service and maintenance contract. The Commission believes that it is extremely important that this office encourage and promote usage of the system by all state agencies and postsecondary education institutions if the system is to meet its potential and help improve the quality of state government. The office should meet with representatives from the Department of Administration to review current state travel policies and analyze the need for new policies in light of teleconferencing as a travel alternative or meeting enhancement tool. The office should also be responsible for working with the information technology resource official designated for each state agency to promote use of the system by the different agencies and to coordinate information technology initiatives emanating from other agencies.

2. An office at the state level should be assigned responsibility for the development and promotion of the system and for coordinating its usage.

Location of Office. These responsibilities should be assigned to the Department of Education. The Department of General Services has indicated that their offices are available for technical assistance but would not be well suited for scheduling and coordinating a statewide system. The Department of Education has considerable expertise as represented by the Office of Education Technology and Communication, the Office of Instructional Television and Radio and Educational Products Distribution, and the Office of Florida Public Broadcasting. Each has strengths and expertise which could contribute to such an undertaking. Of particular importance is the Office of Educational Technology and Communication under the Deputy Commissioner for Educational Management which provides a direct link to the Commissioner and all the Divisions and works closely with school districts, colleges and universities. It is responsible for the Florida Information Resource Network (FIRN), a high-speed, statewide, data transmission network, and could coordinate the two enterprises. The Office of Instructional Television and Radio and Florida Public Broadcasting are both under the Deputy Commissioner for Special Programs and have high-level placements in the Department. The Office of Instructional Television and Radio has strong links with the institutions and considerable experience in distribution of programming. Florida Public Broadcasting has experience with satellite

transmission and professional contacts with local broadcasters. A review of similar systems in other states show that many place the system level office in the education department. However, the policies and procedures developed should clearly reflect the intention to have the system used by all state agencies. If, in the future, demand outstrips capacity, then additional locations beyond the original 28 should be considered. However, in all cases, priority should be given to educational programming. The office should be provided with the additional resources necessary to carry out the new responsibilities. It is important that the office provide strong technical support for the institutions and promote maximum usage of the system.

3. The state level office should be located in the Department of Education.

Use of Existing Equipment. A considerable amount of equipment is already owned by postsecondary educational institutions in Florida. There are at least twelve institutions that already have satellite receiving dishes, ten of which appear suitable for this system. The audio portion of the system is already available. In fact, there is already more audio capacity than the system needs. The system requires an audio bridge unit with as many lines as there are sites and Lively Area Vocational Center has two 20-line units and Valencia Community College has one 24-line unit. Either unit could be used to provide the interactive audio for a video teleconference or could be used by itself for audio teleconferencing. With two different bridges, two audio teleconferences could be occurring simultaneously. A number of institutions have auditoriums equipped with television monitors.

The existing equipment needs to undergo a technical analysis to ascertain whether it is suitable for use in a statewide network and if so whether adjustments or retrofitting is needed. Though initial information indicates that most of the existing receiving stations are compatible with the objectives of the system, a more thorough technical analysis is needed including a site placement analysis.

4. The State should undertake a technical analysis of the existing satellite receiving equipment in Florida's postsecondary institutions to ascertain compatibility with a statewide network.

Expansion of the System. The designated office would be responsible for the expansion of the system to meet the goals of statewide coverage. After assessing the compatibility of the existing equipment to be part of the statewide system, the office would be responsible for determining the need for any additional sites beyond the original 28 and for developing an implementation plan. The plan should address the specific site selection within each community college region. Site selection must be made both in terms of which postsecondary education institution in a region as well as which campus of the selected institution would be the most effective location. A major factor in determining site selection is enhancing the goal of statewide coverage. Other criteria for site selection should include demonstrated institutional commitment to supporting and promoting use of the system locally and as part of a statewide network, a willingness to match institutional resources to complement state allocations, evidence of cooperation and coordinated planning with other area postsecondary institutions, and potential for linking up with telecommunications systems already in place at area institutions. It is important that the needs

of people in rural areas be given full consideration in planning for expansion of the system.

5. An implementation plan should be developed for determining the number of new sites needed, their location and the timetable for installation.

Appropriations for the System. To implement a statewide network, monies would be needed for support of the statewide management office, a technical analysis of existing resources, additional receiving sites and for initial operating, publicity, and maintenance expenses at the sites.

The Department of General Services has estimated the costs to a state office for coordinating a system of 28 different sites at $56,000. This was based on one and one-half full-time professionals and one clerical person half-time. Estimates for the salary levels of the personnel included complete benefits for state employees. The estimate did not include assigning responsibility to the office for promotion of the system. This added responsibility could increase the costs. See Appendix B for an analysis of the requirements for the office.

A technical analysis of existing resources would require a visit to each campus that presently owns a video receiving dish. At present, ten potential sites have been identified. If an outside consultant is required, it is estimated that ten one-day visits would cost the State $4,000.00 including professional fees and travel. If a qualified state employee conducted the visits, costs would be considerably less.

The Department of General Services has estimated that the purchase and installation of equipment for 28 sites would cost $673,298 or $24,046 per site. This would be a one-time outlay and the total amount would depend on how many sites the technical review identifies as in need of enhancement.

The Department of General Services also estimates that annual operating and maintenance costs would be $361,316 for the system or $12,904 per site. Such costs should not be borne by the State on a recurring basis. While the Commission recommends that during the initial start up phase of the system the State provide funds for operations and maintenance to assure adequate support during this critical period, these costs should eventually be covered by public funds generated by credit instruction, system and site user fees, and other non-state sources. Maximum total cost for the system for the first year of operation would be $1,094,614, if none of the existing sites is suitable for inclusion in the network.

6. The funds to purchase the equipment and to cover operating and maintenance expenses should be appropriated specifically for that purpose. In time, operating and maintenance expenditures should be supported through user fees, funds generated by credit instruction and other non-state sources.

APPENDIX A

Associated Industries of Florida Service Corporation

PROPOSAL FOR

THE

FLORIDA COMMUNITY COLLEGE

SATELLITE NETWORK

JON L. SHEBEL
PRESIDENT

"SERVING FLORIDA BUSINESS"

Associated Industries of Florida
Service Corporation

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JON L. SHEBEL
PRESIDENT

PROPOSAL FOR

THE

FLORIDA COMMUNITY COLLEGE

SATELLITE NETWORK

Communication, the process of exchanging information, is the most important element of any organization and is the critical component in the workings of Florida's government and private sector.

The physical distance between the seat of state government and the major metropolitan areas compounds this communications challenge and oftentimes limits the free exchange of ideas and information because of fiscal considerations.

There is, however, an already proven communications system, much of which was developed by high technology industry in this state, that can make Florida's communications challenge more responsive to the needs of its citizens.

Satellite teleconferencing, the ability to transmit both pictures and sound from a central location to multiple receiving locations across the state and to interact via audio links, will not only increase the flow of information, but show a dramatic cost reduction in the $63 million travel and per diem budget of state government.

The proposed communications system is comprised of four sections:

1. Location of receiving stations;
2. Receiving capability;
3. Interactive audio capability, and
4. Display systems.

1. LOCATION

Receiving stations would be located on the campuses of the 28 existing Florida community colleges. These locations are ideally suited as they were originally selected to allow for citizens to receive higher education within a reasonable commuting distance from their home and not require overnight lodging. Community college campuses already have auditoriums for group meetings and ample grounds for the erection of satellite receiving antennae.

2. RECEIVING CAPABILITY

The satellite receiving dish recommended is the Harris Delta Gaine System. The Harris Corporation, a Florida based communication corporation, is a noted leader in the field of satellite communications.

Attached is a detailed study from Harris outlining the receiving equipment necessary to implement the video portion of the system. It is important to note that both the installation and maintenance of this system will be accomplished by Harris employees under the direct supervision of the Melbourne corporate headquarters. The Harris plan is a turnkey operation. Harris will perform all installation alignment and testing and turn over a completely functioning system to the State of Florida. The proposal also includes provisions for maintenance and emergency service from Harris.

3. INTERACTIVE AUDIO

This section of the system will allow the participant at a meeting received by a community college site to communicate directly with the meeting leader and have both his question or comment and the response heard throughout the entire network.

The audio portion is carried over telephone lines and connected together at a central location called a "bridge." This bridge and the interconnect systems needed to interface with standard phone lines will be provided by the Darome Corporation, a firm that specializes in audio teleconferencing equipment. Each location will have an instrument that when attached to a standard telephone allows the audience to hear and react to the program from Tallahassee or other points of origination. The bridge allows for the interconnect of all 28 locations or any lesser number. Please see the enclosed Darome literature for further information.

An alternative to the purchase of bridging equipment and the associated maintenance, personnel and fringe benefit costs, is to contract with a bridging service. The service is available 24 hours a day, 7 days a week. Fee for service is based on the number of locations included in the audio network and the length of time on the network.

4. DISPLAY SYSTEMS

It is our proposal that each location be equipped with two 50-inch RCA projection televisions. The units are portable and easy to set up. Service is available throughout the RCA network of service companies located near all of the 28 community colleges.

In order to complete the system, an uplink, a transmission unit that beams the original video program from a studio or remote location to the satellite, is required. This can be accomplished through one of the two transmission services already available in Tallahassee. Both Florida Public Broadcasting and Phipps Broadcasting have uplinking services; and through microwave relays within the city of Tallahassee, a program could be originated at any location within the capitol complex. Through the use of remote uplinks, either fixed uplink stations already in place in Florida or portable uplinks moved to designated locations, programs can be transmitted from almost any location throughout the state. This will ensure the flexibility necessary in this system should transmissions from other than the Tallahassee area become necessary.

5. COST-EFFECTIVENESS

The initial cost of the entire system will be $651,797. It could be lower. This sum could easily be recovered through a reduction in the travel cost now associated with state employee travel and by timesharing the statewide network with the private sector.

It is our proposal that a central booking agency be responsible for the necessary reservations with blocks of time allocated for both state and private sectors. All users would pay both a systems charge and a per location fee. This system charge will cover all maintenance and personnel costs and include a reasonable profit margin to recover the initial outlay of equipment. When initial capital outlay is recovered, the system fee could be reduced or the income be used for further system expansion. The location charge would compensate the community college for use of the room.

6. MISCELLANEOUS USES

The audio bridge previously mentioned will literally interconnect any number of telephones within the world telephone system. Since this system would also be adaptable for use with radio telephone communications, its interconnect capability would be invaluable during a natural disaster or other crisis situation. The bridge would allow government leaders instant and direct responses from field observers and technical experts and allow for the interaction of all three groups.

A more normal use of the audio network would be the ability of a governmental leader to conduct daily staff meetings with field offices. This capability would allow for direct access to policy makers, pinpoint problem areas quickly and reduce the number of written documents generated (at considerable clerical cost) for internal matters. Field access to leaders would also tend to boost moral by limiting the feeling of isolation felt by field offices removed from the capitol.

Community colleges would be able to use the Harris antenna to view specialty programs that are of interest to academic areas of study. French classes could view programs broadcast entirely in French from the Canadian satellite system; Spanish classes would be able to view programs devoted to Latin culture; and government classes can view C-Span, the U.S. House of Representatives live. The system will be invaluable for educational, general governmental and business purposes.

7. RELIABILITY

The satellite communications system has become a standard of reliability in the communications industry. The Department of Defense has a dedicated system of satellites for national defense communications, and most long-distance telephone is now routed through communications satellites.

The system itself, once installed, will not require any technical expertise to operate. The antenna is positioned automatically and the receiver is tuned in a fashion similar to tuning a home AM or FM radio. The audio visual sections of community colleges would be able to maintain the television projection units and any sort of equipment that may follow.

8. COST

While a system of this size will be acquired through the competitive bid process, below are listed approximate costs of each system component and the total system cost. These amounts are for discussion purposes only. They will probably be lower through the competitive bid process.

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	EXTENDED PRICE
1.	28	Satellite receiving terminal	$9,600	$268,800
2.	28	Turnkey installation of Item #1	4,500	126,000
3.	Lot	Spare parts and depot repair maintenance		44,917
		Video Subtotal		$439,717
4.	28	Telephone connectors with 4 microphones	$910	$ 25,480
5.	1	Complete 30-line phone bridge with installation and training		80,200
		Audio Subtotal		$105,680
6.	56	50' projection TV's	$1,900	$106,400
		Display Subtotal		$106,400
		TOTAL		$651,797

9. CONCLUSIONS

A communications system set forth as we have described above would be both cost-effective and time-efficient for the State of Florida. A similar system already in place in the state of Alaska has shown tremendous cost savings in state travel and allowed for a freer interplay of citizens with their governmental leaders. The state of Alaska uses their teleconferencing system for citizen input during open forums with legislators, hearings, and some legal proceedings. Their system has proven to be so successful that the Governor of Alaska is now anticipating the installation of a secondary satellite receiving system to relieve use pressure on the original system. It is our belief that this system will be a boon to all citizens in the State of Florida.

APPENDIX B

STATE OF FLORIDA
DEPARTMENT OF
GENERAL SERVICES
Larson Building, Tallahassee 32301
Ronald W. Thomas, Executive Director

DIVISIONS
- ADMINISTRATION
- BOND FINANCE
- BUILDING CONSTRUCTION AND PROPERTY MANAGEMENT
- COMMUNICATIONS
- ELECTRONIC DATA PROCESSING
- MOTOR POOL
- PURCHASING
- SECURITY
- SURPLUS PROPERTY

Please address reply to
Room 651, Larson Building
Division of Communications

December 7, 1984

Ms. Carolyn Harrington
Post Secondary Education Planning
Commission
Room 304, Knott Building
Tallahassee, Florida 32301

RE: Proposed Community College Satellite Network

Dear Ms. Harrington:

As a result of your request of November 15, 1984 a study of costs associated with this proposal has been undertaken.

Information has been collected and is presented for 3 subsystems in conformity with the original proposal from Associated Industries of Florida. The numbers have been extended to show total costs for 28 systems as originally quoted to serve the 28 Community Colleges. It should be noted that the 28 colleges actually have 41 campus locations. Some of these locations are separated to serve populations located some distance apart. An example of this is the Melbourne Campus, Cocoa Campus, and Titusville Campus of Brevard Community College. It may be desirable, or even necessary, to have more than one single receive only system to serve this single college. This is also true for colleges located in large population centers such as Florida Junior College at Jacksonville with four campus locations. The desirability for more than one receive system here may be dictated by the size of the auditorium at each location. One auditorium may not be large enough to accommodate the total community.

In any case, I think it is clear that the total number of systems required is, in reality, above 28 and below 41 in number.

The following is a discussion for each subsystem: Display, Audio and Video. In each the assumptions made are stated for each cost. The costs are those associated with the equipment purchased, the cost for installation, recurring costs, operating costs, and maintenance.

Bob Graham, Governor
Jim Smith, Attorney General
George Firestone, Secretary of State
Gerald A. Lewis, Comptroller
Bill Gunter, State Treasurer
Doyle Conner, Commissioner of Agriculture
Ralph D. Turlington, Commissioner of Education

Vendors were asked to update numbers previously quoted. While it is understood that the bidding process will be used to actually acquire this equipment, it is felt that these numbers are representative of what the system might cost considering added options not now identified and inflation.

Finally, there is a tabulation showing costs necessary to initiate the system: equipment costs plus installation and costs for operating the system: recurring costs plus operating and maintenance costs. Operating costs are estimated for 10 hours of use per month. Ten hours could result in as little as 5 hours of teleconference time since an hour of "run up" must be added to each conference for set up time and to establish that all circuits are working.

Sincerely,

Donald R. Allen, Director
Division of Communications

DRA:jfr:kte

DISPLAYS

Original quote:

(56) 50 inch projection televisions
@ $1900.00 each $106,400.00

Contact:

Sea Coast Distributors of Miami,
Mr. Dick Anderson (305) 592-2855

Original quote was for RCA model PJR 500 45" projection televisions not now available.

New model is also a 45" projection TV, model No. PKC 500.

Cost is approximately $2100.00 each plus $50.00 for freight and handling.

Equipment:

56 @ $2150.00 $120,400

Installation:

(Assumes no special supports to raise TV screens for viewing. Sets to sit on floor or raised stage.)

Uncrate, move into position and connect
@ $25.00 each pair (estimate) $700.00

Test: Included in equipment cost. No Charge
Two 100' coax cables per site to connect
TV to receiver of earth station.

200' RG59U @ $.15/ft.	$30.00	
4 connectors @ $.60	2.40	
1 splitter @ $3.00	3.00	
+ Installation labor (est)	35.40	
Total per college	$70.80	$ 991.20
Total Installation		$1,691.20

Implementation:

Equipment and installation $122,091.00

Maintenance:

$75 per set per year on contract with RCA 4,200.00

Recurring Costs Per Year:	4,200.00
Operating Costs Per Year:	
Cost of use of auditoriums No estimate made, may be free.	-0-

AUDIO

Original quote:

28 Telephone Connectors @ $910.00	$25,480.00
1 Complete 30 line phone bridge	76,000.00
Installation and Training	5,200.00
	$106,680.00

Contact:

Darome, Tom Parker
1-800-435-6174

Equipment:

Complete 30 line bridge	76,000.00
Less 10% state discount	(7,600.00)
Installation and Training	5,200.00
Freight (estimate)	1,700.00
	$75,300.00
28 Telephone connectors with 4 microphones @ $910	25,480.00
Less 10% state discount	(2,548.00)
Freight @ $10.00 (estimate)	280.00
28 Acoustic loops to prevent feedback @ $300 each	8,400.00
	$31,612.00
Total Equipment	$106,912.00

Installation:

Each college	
28 1A2 phones @ $87.00	$2,436.00
150' wire each unit @ $40.50	1,134.00
Install phone and run wire @ $120 each	3,360.00
	$6,930.00
Bridge	
Unpack, move into position etc.	150.00
30 wire runs of 150' @ $40.50	1,215.00
Installation of wire and connections	3,600.00
	$4,965.00
Total Installation	$11,895.00

Implementation:

Equipment and Installation	$118,807.00

Recurring Costs Per Year:

Access Charges (Line)	
28 lines @ colleges @ $23.15/Mo.	$7,778.40
30 lines @ bridge @ $23.15/Mo.	8,334.00
Access Charges (Basic)	
28 lines @ colleges @ $6.00/Mo.	2,016.00
30 lines @ bridge @ $6.00/Mo.	2,160.00
30 lines @ bridge @ $1.30/Mo. (Admin.)	468.00
	$20,756.40
Maintenance:	
Estimate $200/Month	2,400.00
Bridge Operator	
Estimate 1/2 time for $30,000/Year employee (loaded salary)	$15,000.00
Total Recurring Costs	$38,156.00

Operating Costs Per Year:

Based on 10 hour/month 30 calls @ $.15 per min. x by 10 hour/month x 12 month/year	$32,400.00

VIDEO

Original quote:

28 Satellite receiving terminals @ $9,600 each	$268,800.00
28 Turnkey installation of above @ $4,500 each	126,000.00
1 lot spare parts and depot repair maintenance	44,917.00
	$439,717.00

Contact:

Harris Corporation
Betty Day
(404) 928-3172

Equipment:

28 Satellite receiving terminals @ $9,600 each	$268,800.00
With 2 improved receivers model 6529 to replace model 6528 quoted plus improved demodulator.	

Installation:

28 turnkey installation of above @ $4,500 by Harris	$126,000.00
Plus an additional $1,000 at each college to cover soils survey, permit costs, power wiring, etc.	28,000.00
	$154,000.00

Spares Package:

To be stored at Harris. To be essentially a spare terminal	$9,600.00

Implementation:

Equipment and Installation and spares	$432,400.00

Recurring Costs Per Year:

Maintenance	
$720 per site per year Harris Contract Operator at each college 1/5 time for	$20,160.00
$30,000/year loaded salary man	$168,000.00
Total Recurring Costs	$188,160.00

Operating Costs Per Year:

Based upon 10 hour/month	
Transponder @ $450/hour	$54,000.00
Up-link use cost @ $70/hour	8,400.00
Studio cost @ $300/hour	36,000.00
Total Operating Cost	$98,400.00

NOTE: No estimate for cost of programs or system management.

COST TABULATION

	Display	Audio	Video	Total
Implementation	$122,091	$118,807	$432,400	$673,298
Recurring Costs Per Year	4,200	38,156	188,160	230,516
Operating Costs Per Year (Based upon 10 hour/month use.)	-0-	32,400	98,400	130,800

Implementation	$673,298
Total Cost/Yr. (Operating cost and recurring cost)	$361,316

STATE OF FLORIDA
DEPARTMENT OF
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Larson Building, Tallahassee 32301
Ronald W. Thomas, Executive Director

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- SECURITY
- SURPLUS PROPERTY

Please address reply to
Room 651, Larson Building
Division of Communications

January 15, 1985

Ms. Carolyn Herrington
Post Secondary Education Planning
Commission
Room 304, Knott Building
Tallahassee, Florida 32301

RE: Proposed Community College Satellite Network

Dear Ms. Herrington:

In order to answer your letter of December 16, 1984 concerning the size of the office required to coordinate and operate the Community College Satellite Network, it probably would be more productive to talk about the responsibilities of that office first and then, with those responsibilities in mind, determine the manpower required to staff that effort.

Before responsibilities for operation of the system can be set down, some general ground rules must be assumed. I made the following assumptions.

1. Responsibility for operation would be limited to the system proposed. It would not include any up-link operation or responsibility for obtaining programs or material to be up-linked.

2. This office would not have any responsibility for the programming effort required to generate material for use on this system.

3. This office would not be involved with seeking out uses for the network thereby insuring the systems effective use.

4. Each down-link would be owned by the individual community college. The person operating that equipment would be on the community college payroll.

With those assumptions in mind, I see the following as duties for this office:

1. Schedule the use of facilities at each community college and the telephone bridge for both educational efforts and private sector community activities. This might be for state-wide programs or regional programs. It might even involve use of only one down-link at a time. Included in this would be; scheduling use of the auditorium, contacting the person at each location for operation of the equipment, and scheduling a moderator for those meetings involving state business including education. This activity would also be a coordination effort since the individual schools might set up schedules of their own for down-linking existing programs for distribution around campus or teleconferencing for their own use or for use of the private sector where the school would collect a fee.

2. Maintenance of all equipment through maintenance contracts: This effort would involve preparation of specifications for the maintenance required in each equipment area; audio, video, and display. Bids would be taken in cooperation with a purchasing office for the maintenance specified. Contracts would then be given to the best qualified low bidder and each school could either make use of this contracted maintenance or provide their own maintenance since they would own the equipment. Maintenance for the telephone bridge could be part of the audio specification, a separate specification and contract or it could be part of the bridge operators duty.

3. Supervise the person employed to operate/maintain the telephone bridge.

4. Prepare budget requests for State operating funds for this office.

5. Make arrangements, on occasion, to lease transponder time for educational programs or some other use such as teleconferencing.

6. Contract for rights to down-link certain programs where a fee is involved such as programs prepared by IEEE.

7. Training: Maintain some relationship with original equipment suppliers such that they would train people, as necessary, to operate the particular equipment involved. This would probably be limited to the receive only earth station and the telephone bridge. In the case of the earth station, the cost of retraining would be borne by the individual college.

8. Serve as the first contact for each community college. This would allow a private sector user a single point of contact for use of the network. This might include quotation of a fee that each college might charge a private sector user for use of their facility and down-link equipment. Establish a fee schedule for private sector use of the telephone bridge.

Considering the above responsibilities, I propose the following manpower:

One person full-time for everything described above except telephone bridge operation.

Estimated loaded salary		$30,000/Year

One person half-time to operate the telephone bridge and possibly be responsible for maintenance of same.

Estimated loaded salary	$30,000/Year	$15,000/Year

Clerical Help: One person half-time.

Estimated loaded salary	$22,000/Year	$11,000/Year
Total		$56,000/Year

If I can be of any further help on this matter, please call me at 488-3771.

Sincerely,

John F. Raum

John F. Raum, P.E.
Communications Engineer

JFR:kte

APPENDIX C

DEFINITION OF TERMS

Ad hoc: Refers to a teleconference that uses facilities that are temporarily linked together for a specific meeting or event; implies a one-time or occasional use of teleconferencing, as opposed to a permanent system or regular usage.

Audio teleconferencing: Two-way electronic voice communication between two or more groups, or three or more individuals, who are in separate locations.

Audio speaker-microphone unit: Equipment that usually includes at least one speaker, multiple microphones and a telecommunications interface to accommodate a group of people in a teleconference.

Audiographics: Refers to the transmission of graphics and test information over a narrow band telecommunications channel, such as a telephone line or radio subcarrier.

Bandwidth: The maximum frequency (spectrum), measured in Hertz or cycles per second, between the two limiting frequencies of a transmission channel; the range of frequencies that can be carried by a transmission medium without undue distortion.

Bridge: A device that is designed to interconnect three or more telecommunications channels such as telephone lines.

Broadband (windeband): A telecommunications medium that carries high frequency signals; includes television frequencies of 3 to 6 million Hertz.

Broadcast: The one-way transmission of information.

Cable television (CATV): A transmission system that distributes broadcast television signals and other services by means of a coaxial cable. Most cable systems have the potential for two-way communication in addition to broadcast television.

Closed-circuit television: A private system for transmitting television signals, such as a university TV network.

Coaxial cable: A metal cable consisting of a conductor surrounded by another conductor in the form of a tube which can carry broadband signals by guiding high-frequency electromagnetic radiation.

Codec: A coder-decoder that is used to convert analog signals, such as voice or video, into digital form for transmission over a digital medium and, upon reception, reconverts the signals to the original analog form; may also perform other signal processing functions.

Common carrier: An organization (such as a telephone operating company) that provides communication services to the general public at non-discriminatory rates, without control of message content.

Communications satellite: A "relay system" in orbit above the earth's surface for telecommunications signals such as voice, video and data; requires earth stations to transmit and receive the signals at the ground locations.

Compressed video: Video images that have been processed to remove redundant information, thereby reducing the amount of brandwidth required to send them over a telecommunications channel. See video compression.

Compressed video codec: A signal coding and processing device that decreases (compresses) the amount of information in a video image; may also perform other signal processing functions.

Computer conferencing: Group communication through computers; the use of shared computer files, remote terminal equipment and telecommunications channels for two-way group communications.

Computer graphics: The alphanumeric and graphic information generated by a computer.

Conference call: A dial-up, operator-assisted telephone call that connects more than two individuals.

Continuous presence video: Refers to a type of video teleconference that provides simultaneous and continuous pictures of all participants. The images are usually close-range shots of the groups and may be viewed on a large screen or on one or more monitors. Contrast to voice-switched video.

Dedicated lines: Leased telecommunications circuits that are devoted to a specific application; e.g., leased telephone lines used for a teleconference network connecting fixed locations.

Dedicated system: A facility that is devoted to a specific purpose, such as teleconferencing.

Dial-up teleconferencing: Using the public switched telephone network to interconnect lines for a teleconference either with or without operator assistance.

Digital: A form of information that is represented by signals at discrete intervals or steps, as contrasted to continuous or analog signals.

Direct broadcast satellite (DBS): A satellite designed with sufficient power so that inexpensive earth stations can be used for direct residential reception.

Domestic satellite: A satellite that provides communication services primarily to one nation.

Downlink: An earth station that receives satellite signals.

Earth station (earth terminal): The ground equipment including a dish and its associated electronics used to transmit and/or receive satellite communications signals.

End user: The ultimate consumer of a service.

Fiber optics: A communications medium based on a laser transmission that uses a fiber, or thread-like material, which carries light.

Freeze-frame video: (1) A device that transmits and/or receives still video pictures over a narrowband or mediumband telecommunications channel; (2) may refer specifically to a still frame video unit that "grabs" the image from the camera or other video source and "freezes" it in a fraction of a second. See slow-scan video.

Frequency: The rate at which a current alternates, measured in Hertz (cycles per second) on a telecommunications medium.

Full-duplex: A communication channel over which both transmission and reception are possible in two directions at the same time; e.g., a four-wire circuit.

Gain: An increase in signal power in transmission from one point to another; usually expressed in decibels.

Half-duplex: A communications channel over which both transmission and reception are possible but only in one direction at one time; e.g., a two-wire circuit.

Hertz (Hz): The unit of frequency. One Hertz is equal to one cycle per second. Named in honor of Heinrich Herz, first to detect such waves in 1883.

High-resolution graphics: A system that provides a greater resolution than the standard 525-line video image; allows more detailed graphics to be seen clearly, often refers to a system with a resolution of 1,000 lines.

Hollywood syndrome: The tendency to base one's video teleconferencing behavior on a model that includes a highly polished presentation rather than interaction and the use of fast-paced visuals for effect rather than substance.

Instructional Television Fixed Service (ITFS): A non-broadcast television service that is typically used for closed-circuit educational applications and requires special antennas and converters to translate the signals for viewing on ordinary television sets.

Meet-me bridge: A type of telephone bridge that can be accessed directly by calling a certain access number; provides dial-in teleconferencing. The term "meet-me bridging" refers to the use of this type of bridge.

Meet-me teleconferencing: A teleconference that uses a met-me (dial-in) bridge to interconnect telephone lines.

Microwave: High-frequency radio waves used for the transmission of audio, video or data. Requires a clear line of sight between transmitter and receiver.

Multiplexing: A technique used to transmit signals from different sources over a single channel at the same time.

Narrowband: A telecommunications medium that carries lower frequency signals; including telephone frequencies of about 3,000 Hertz and radio subcarrier signals of about 15,000 Hertz.

Off-premises system: Refers to a teleconferencing room or equipment located outside of a user organization's facility, e.g., a video teleconferencing room operated by a vendor and available to the public for a fee.

Omnidirectional microphone: A microphone that detects and transmitts sound from all directions.

On-premises system: Refers to a teleconferencing room or equipment that is located within the user organization's own facility.

PBX: Private Branch Exchange; a private telephone exchange that serves a particular organization and has connections to the public telephone network; refers to a multiline telephone exchange terminal with various features for voice and data communications.

Slow-scan video: (1) A device that transmits and/or receives still video pictures over a narrowband telecommunications channel; (2) may refer specifically to a still frame video unit that accepts an image from a camera or other video source one line at a time, necessitating that the subject in front of the camera remain stationary for a number of seconds. See freeze-frame video.

Special event teleconferencing: Refers to a teleconference that uses facilities that are temporarily linked together for a specific event; implies a temporary satellite network for one-way radio and two-way audio.

Telecommunications: The use of wire, radio, optical and other electromagnetic channels to transmit or receive signals for voice, video, and data communications; communications over distance using electronic means.

Teleconferencing: Two-way electronic communication between two or more groups, or three or more individuals, who are in separate locations; includes group communication via audio, audiographics, video and computer systems.

Telephone conference bridge: A device that is designed to link three or more telephone channels for a teleconference; usually refers to a bridge that provides only dial-up teleconferencing where an operator calls each participant. Contrast to meet-me bridge.

Transponder: The equipment on a satellite that accepts the signal sent from earth and, after amplifying and changing the frequency, sends it back to earth for reception; may be referred to as a repeater.

Uplink: An earth station that transmits a signal to a communications satellite.

Video compression: A coding technique used to reduce the bandwidth required for the transmission of video images by reducing redundant information within or between video frames; also called bandwidth compression, data compression or bit rate reduction.

Video teleconferencing (videoconferencing): Two-way electronic voice and video communication between two or more groups, or three or more individuals, who are in separate locations; may be fully interactive voice and one-way video; includes full-motion video, compressed video and sometimes freeze-frame video.

Videodisc: A hard disc that stores information in microscopic "pits" indented into the surface; provides a high-capacity storage medium of over 50,000 frames of information; used to store and retrieve video, audio and other information.

Videotext: A service similar to teletext except that information is delivered by telephone channels and a user can interact with the data base to select information for viewing.

Voice actuated: The ability of a piece of equipment to become activated in response to the sound of a voice.

Voice-switched microphone: A microphone that is activated by a sound of sufficient amplitude; generally allows only one person to speak at a time.

Voice-switched video: Refers to a type of videoconference in which the cameras are activated by voice signals to send a picture of a particular person in the group. Not all participants can be seen at any one time in contrast to continuous presence video.

Voice-switching: An electrical technique for opening and closing a circuit in response to the presence or absence of sound.

Source: Adopted from Olgren, C.H., and Parker, L.A. Teleconferencing Technology and Applications.

State of Florida
Department of Education
Tallahassee, Florida
Ralph D. Turlington, Commissioner
An equal opportunity employer/affirmative
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FLORIDA: A STATE OF EDUCATIONAL DISTINCTION. "On a statewide average, educational achievement in the State of Florida will equal that of the upper quartile of states within five years, as indicated by commonly accepted criteria of attainment."

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